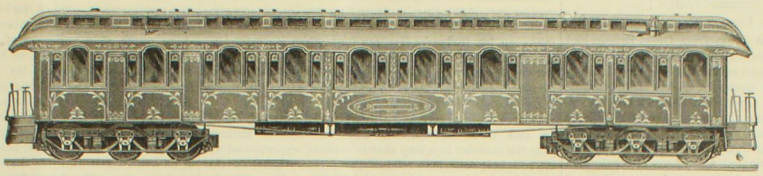
NATIONAL CAR AND LOCOMOTIVE BUILDER.



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Miscellaneous Items.

Engineering (London) says that the United States export locomotives to the value of $3,000,000 annually.

THE St. Charles (Mo.) Car Co. have contracted to build 1,000 freight cars for the Atchison, Topeka & Santa Fé road.

THE Gilbert Car Works have just completed a very handsome private car for the President of the Delaware & Hudson Canal Co.

THE Brooks Locomotive Works, Dunkirk, N. Y., have taken a contract for twenty locomotives for the Chicago, Kansas & Nebraska road.

THE Illinois Central shops, in Chicago, have begun work on ten mogul freight engines, with 18×24-inch cylinders and 56½-inch driving wheels.

IN order to fill the demands made upon them, the works of the Dickson Manufacturing Company, at Scranton, will be kept running twenty hours a day for two months.

THE Schenectady Locomotive Works now have at work 950 men. From 16 to 18 engines are turned out every month. The monthly pay-roll amounts to nearly $40,000.

THE new bridge of the Baltimore & Ohio R. R. across the Susquehanna River at Havre de Grace, Md., will be 6,315 feet in length. The river spans alone will cover 3,920 feet.

THE passenger business of the Boston & Maine Railroad this season is away ahead of the most sanguine expectations, and bids fair to be the largest in the aggregate in the history of the corporation.

THE Union Pacific road has recently put in service 15 new locomotives, and 15 new passenger coaches have been ordered for early delivery. The Omaha car shops are busy on repairs necessitated by the heavy passenger traffic of the season.

NEW car wheel works are in course of construction at East Buffalo, N. Y. The owners are Mr. Henry M. Brown, formerly general superintendent of the Buffalo Car Wheel Works, and a Mr. Trude, of St. Louis. The works will be ready for business in a few weeks.

THE Gilfillan Car-seat Company, of Fort Scott, Kan., has been incorporated for the purpose of manufacturing reversible car-seats. The directors are J. E. Westervelt, E. N. Gilfillan, Jas. G. Ogden, Jacob Rainbaugh and J. M. Bright. Capital stock, $100,000.

MR. JOHN W. CLOUD, Engineer of Tests on the Pennsylvania R. R., has been appointed Mechanical Engineer, in place of the late Mr. J. B. Collin. The office of engineer of tests is now merged in that of mechanical engineer, who has charge also of the department of physical tests.

THE Marshall (Texas) Car Wheel & Foundry Co. have large contracts, and are running with a full set of workmen in every department. They have added a nut department, a brass foundry and also a department for the manufacture of a patent logging car, and have large orders from the lumbermen of Eastern Texas.

THE Supreme Court of Tennessee has confirmed the decision of a lower court, on appeal, that railroad companies are liable for passengers' baggage lost from cars of sleeping car companies, for the reason that so long as the sleeper forms part of the train, negligence of sleeping car agents is the negligence of the railroad company running the train.

A CONTRACT has been let for the construction of 2,202 new standard freight cars for the Pennsylvania system west of Pittsburgh. The cost will be $1,000,088, and the cars will be built at once by the following companies: United States Rolling Stock Company, Missouri Car and Foundry Company, Michigan Car Company and the Peninsular Car Company.

STEEL WIRE that is regularly used for constructive puposes by a steam plow making firm in England, has a tensile strength of 150 tons to the square inch. Mild steel bar is regularly produced with a tensile strength of 120 tons to the squre inch. Were material of this kind freely adopted in places where it could be used to advantage, it ought to reduce materially the dead weight of rolling stock.

THE Boston & Albany road has recently completed two handsome passenger coaches costing about $5,500 each. They are 57 ft. 6 in. long and have trucks with 42-inch paper wheels and Bemis axle boxes. The interior finish is in solid mahogany, and the roof of the Norman oval style. There are 34 seats with concave upholstering. The windows are plate glass, and the lavatories of fine marble with nickel trimmings.

THE Pullman Car Co. has purchased the plant of the Dure Car Manufacturing Co. at Wilmington, Del., and will at once enlarge the works and make them the Eastern headquarters for repairs and new work. Thomas W. Bowers, of the late firm of Bowers, Dure & Co., will represent the Pullman Co. as superintendent. The works of the company at Elmira, N. Y., will be vecated in October and transferred to Wilmington.

THE Northern Railroad of France has found by experiment that nickel can be rolled upon soft steel plates in such a manner as to produce a material, for head-light reflectors, of equal brilliancy of reflection with those made of silvered copper. These reflectors are reported also not to rust, and, owing to the greater strength of the material, to be less easily knocked out of shape. The cost is only 55 per cent. of the cost of silvered copper reflectors.

IT is said that the Pennsylvania Railroad Co. has begun the construction, at its Altoona shops, of 60 locomotives, "Class R.," the largest engines that are made. Two engines of this class were built at the shops a year ago, and the company has been experimenting with them for several months and find them satisfactory. The weight of the new engines will average 120,000 pounds each, whereas the moguls or "Class I.," the largest engines heretofore constructed, weighed only from 95,000 to 105,000 pounds. It is expected that the new engines can draw from 15 to 20 per cent. more than the moguls, and it is the purpose of the company to introduce them generally on the heavy mountain grades. On account of the great weight of the locomotives the company is strengthening its bridges all along the line.

THE huge ingots necessary for rolling the large, thick mild-steel plates now so extensively used for marine boiler work, have proved very difficult to manipulate properly, and many complaints have been made that part of the plates are spongy and consequently deficient in tensile strength. An Engiish metallurgist has lately proposed what appears to be a promising remedy for the trouble. He compared the spongy spots in the open-hearth steel ingots to the "seedy boil" often found in glass. The defect in the latter material is prevented by the use of the Siemens continuous glass melting process, where the glass is melted away from contact with the flame. The proposal is made to adapt this Siemens furnace for the purpose of steel melting, and the natural inference is that the steel ingots so produced will be free from spongy defects.

THE Baldwin Locomotive Works are building four caustic soda locomotives to run on a Minneapolis street railway upon which steam motors are not allowed. These engines are the first of the kind that have been built in this country, and are being constructed under the direction of a German engineer. They have much the same appearance as a street car, and will have about the same power as the engines of the New York elevated roads. They are about 16 feet long, entirely boxed in, with no visible smoke-stacks or pipes, as there is no exhaust or refuse. The boilers containing the soda are of copper, 84 inches in diameter and 15 feet long, and having tubes running through them as in steam boilers. An engine of this kind, imported from Germany, was tried on the Chicago City Passenger Railway last spring and found to be deficient in tractive power.

THE New York City & Northern Railroad has been putting on airs lately and indulging in the luxury of a receiver. The receiver in turn has issued a manifesto of management that is pompous enough for a proclamation of a German princeling. The edict elucidates the authority of the receiver and of his executive officers, the traffic manager, the master of transportation, the car accountant, the purchasing agent, the master of machinery and the roadmaster. The road is 58 miles long and has 17 locomotives. In the explanation of each officer's duties, the master of machinery is advised that he will have charge of all equipment and machinery, but he must not appoint or transfer engineers or firemen without consulting with the master of transportation. It will be a queerly operated railroad where small matters of this kind must be placed under dual control, but it is the kind of management to be expected from placing men who know nothing about the business at the head of railroads as receivers.

To what extent tapping a yellow pine tree injures the timber is a question that has not been decided. There are men who assert that lumber produced from the timber cut in a turpentine district is not so good as that from trees which were never boxed, yet how little these men know about it is shown by the fact that if the two kinds of lumber be laid side by side they are unable, oftener than otherwise, to tell which is which. Government contracts for yellow pine specify that it must be un-boxed, but it is an open secret that government timber inspectors can not detect the difference, and as a result the contractor is not particular to follow the instructions of the document by which he is supposed to be guided. The absence of pitch the wood is generally supposed to be evidence that the tree was tapped. The evidence is misleading, however, for tapped timber is some times full of pitch. The subject is one which theoretically has caused some commotion, but which practically, so far as we have observed, is of less importance than has been ascribed to it by many.—*Northwestern Lumberman.*

A NEW YORK man has invented a paper railway tie, for which he naturally looks for great things. In the process of manufacture the tie is subject to pressure and heat, and it is also made proof against dampness. The inventor says that while the average life of the wooden tie is but five years, his paper tie will last thirty years. How he knows it will last so long we have not ascertained, for as yet not a paper tie has been laid. It can also be furnished for less money than the wooden tie, the inventor claims. Another great point made by the paper tie man is that the forests are rapidly disappearing, and the general use of his tie would tend to preserve them. We sincerely hope that the inventor is speaking the truth in everything he says. It would be a relief not to be obliged to see going the rounds every few days the old stock trash as to the area cleared of its timber every year in order to supply the ties needed. The figures are outrageously large; they have been knocked on the head by high railway authority; still they keep going, going. If this New York inventor can lasso these figures, first set afloat by some denudatic crank, he will by no means have lived in vain.—*Northwestern Lumberman.*

SOME important improvements are being made in the Niagara railroad suspension bridge, which may turn out to be as dangerous as they are difficult of accomplishing in an engineering way. The four massive towers of stone, which support the big cables of the bridge, are to be replaced with iron supports, and it is thought now that, although perhaps dangerous, this can be done without much interference with the use of the bridge. Every precaution to avoid an accident has been taken by Mr. Buck, the engineer in charge of the work. Workmen are now making room on the sides of the towers for the preliminary iron work, and stone is being chipped away with care by experienced men, who know just which ones to remove. On the tops of the towers, men who look like pigmies from below, are drilling in the caps, so that when the time comes the hydraulic jacks may be applied and the great cables safely cradled from the stone supports which have held them up so long, and placed on strong iron towers which will replace the stone ones. The iron-work is being made in Detroit, and the shipments of material will soon begin. The cost of the new towers will be $40,000. Disintegration of the stone is the reason for changing the towers.—*American Manufacturer.*

Rambles on British Railways.

[EDITORIAL CORRESPONDENCE.]

LONDON (Eng.), August, 1886.

An absence of thirteen years from Great Britain had prepared me for finding great changes on the railways of the British Isles. I had been repeatedly told that the British railway machinery of to-day is a vast improvement over that in use in 1873. On landing at Liverpool, I naturally began a process of mental comparison which has been going on ever since, but so far I have not found any improvements of a very startling nature. To be sure all leading railways have adopted some form of continuous brake for their passenger equipment, and the system of station signaling has been carried to great perfection. Some of the locomotives and carriages are heavier than they used to be, but most of the vicious features about them remain the same.

In one respect British railways are decidedly ahead of American practice. Trains are run much more frequently than with us, and all important cities are connected by a fast train service that reduces the inconvenience of distance to its lowest limit. English people travel considerably less than Americans do, yet cities of far less importance than New York and Boston are connected by hourly trains that get over the road at a speed of forty miles or more an hour. Public opinion in Britain appears to be exceedingly powerful in compelling railway companies to effect improvements, but many conveniences which American travelers would regard as essential, are neglected because the public do not demand them with any degree of unanimity. The necessity of having trains run fast and frequently has been considered important, but being penned up in small compartments of short rough riding carriages, has been deemed of little consequence so long as the railway companies display solicitude to make the traveler's sojourn in the carriage as short as possible. People who have been so far over the world as to become familiar with the conveniences of the American check system for baggage, growl about the annoyance of having continually to look after their baggage on British railways; but the great mass of railway travelers remain in blissful ignorance of the fact that any check system exists which prevents people from having constantly to haunt luggage vans during every journey to see that their effects are not left behind or set off at the wrong place, and no general demand for a change exists. When a bad railway accident happens through a cranked axle breaking, the press raises a clamor against the practice of using an axle that fails so frequently, but railway mechanical engineers insist that this shape of axle is a good one, so the clamor against it dies out for the time and more of them are put into service.

Although the English railway companies do not introduce the baggage checking system, they appear in some cases to appreciate its advantages, for all the roads running out of Liverpool announce to American travelers that they can have their baggage checked from New York to London for the modest sum of one dollar per package, or from the landing stage to London for two shillings. The Midland Railway, which appears to have the best railway machinery in Europe, advertises Pullman sleeping cars as an inducement for American travelers to patronize their line, and those who have traveled over this route speak very highly of the accommodation provided. The London & Northwestern play what is reported as a strong advertising card, by telling passengers that they will be pulled by one of Mr. Webb's famous compound locomotives, for which there is no extra charge made, even though the engines on this special service bear the names of "President Washington," "President Lincoln" and "President Garfield," "City of Chicago," and so on. Perhaps more attractive to the weary traveler is the information given by the same company, that sleeping cars (not after the American style) provided with pillows, blankets, sheets and lavatory accommodation, are attached to the train, and that an attendant accompanies the car.

An American traveler who is interested in the history of railway development, finds on landing at Liverpool that he is on classic ground, for nothing is easier than to take a trip over the Liverpool & Manchester Railway, the scene of George Stephenson's great triumphs, the first railway constructed for carrying general traffic. An hour of loitering round the fine station, watching the arrival, departure and make-up of trains, reveals many interesting novelties to a stranger. On getting into one of the trains we get whisked to Manchester, 32 miles, in one hour, two stops being made on the way. During the brief journey, one keeping his eyes open can appreciate the huge expense that was incurred on this pioneer railway to render fast traveling safe and easy. The road has been made practically straight and level by cutting through high ridges and filling up deep depressions. Every road, farmers' crossing or pathway crosses the railway by a bridge of substantial masonry either above or below the grade. In some portions of the way there are three or four of these crossings per mile, and many parts of the embankments are held up by heavy masonry, so that the first cost of the structure must have been enormously high.

While traveling over this and other British railways, I have noted that although the average speed is high, the engine seldom attains the velocity between stations common on American fast lines. The stops are so few that the maximum running speed is maintained during the greater part of the way, no ascending grades of any consequence intervening to reduce speed in one portion to be made up by furiously fast running when a descending grade was reached. Although I have timed the speed frequently on all the railways passed over in England and Scotland, I have yet failed to find the velocity to be under sixty seconds for one mile.

The run from Liverpool, although over one of the levelest and most substantially built railways in Britain, jolts the traveler in a way that is seldom experienced on the roughest American roads. The primary cause of this is the short carriages, which jump alarmingly with the high speed.

A limited number of Pullman cars are run on the Midland Railway and its connections, and nearly all lines run "saloon" cars with some sleeping accommodation for the more protracted journeys; but the vehicle that carries the great bulk of the passenger traffic is a four or six-wheel carriage, from 25 to 30 feet long. The carriage has five or six compartments that are entered from the side, the passengers sitting facing each other, with their backs or faces to the engine. While traveling in these carriages I have concluded that the solicitude displayed by American railway travelers to sit with their faces to the engine is an acquired taste, for British travelers seem rather to prefer sitting with their backs to the engine. The first-class compartments have each person's seat divided off from the others by arm-rests. These seats are finely upholstered, and are very comfortable for a sitting or half-lounging position. The second and third-class cars have plain cushioned seats; some of the latter have no cushions. The first-class compartment holds six persons, the others hold ten persons each when called full, and at that time they are decidedly full. To make a long journey in a compartment of this kind, where the people are set about as close as herrings in a barrel, is no pleasant experience, but it is done daily without noisy complaint, for any one feeling reluctance to traveling in that way has the option of going first-class on paying a little more than double third-class fare.

By being able to crowd their passengers into small space, British railway companies do their third-class passenger traffic with a low percentage of dead weight to the paying load. A five compartment third-class carriage weighs about 20,000 pounds and accommodates 50 passengers—400 pounds of car weight to each passenger. A first-class car of the same size accommodates 30 people, giving 666 pounds of car weight for each passenger. My experience of the trains is that the third-class cars are generally well filled while the first-class are nearly empty.

The cars are generally carried on two or three pairs of wheels set in pedestals fastened to the sills. Very long springs are set resting on the axle boxes, equalizing bars being seldom used. As the spring has to intervene between the axle box and the bottom timber of the car, the latter is necessarily set high. The wheels are about 42 inches diameter, so when an axle box and spring are set above the journal and space left for clearance, the bottom of the car floor is pretty high. The railway interests of the British Isles suffer from the want of organizations similar to our Master Car-Builders' and Master Mechanics' Associations, and the effect is visible in the variety of heights of draw-bars. I asked several mechanical officers what the ordinary height of their draw-bars was, and none of them seemed to be sure just what the correct height was. Numerous measurements I took showed the draw-bars and buffers to vary in height from 40 to 45 inches. The common height appeared to be 42 inches.

Objections are raised against the introduction of the American type of rolling stock into Britain, for the reason that its height would entail the raising of all bridges. I think the high-bodied American car could be run over most British roads if it remained on its own low trucks, but it could not be set up above the high wheels arranged as they are in England. There is no likelihood, however, of engineers being called upon to devise the means of running American cars in Britain, for the natives are quite well satisfied with what they have got, and it takes something stronger then a moral earthquake to raise a demand for radical changes.

The people have inherited the prejudices of the engineers who took the lead in introducing railways, and they are so accustomed to receive the views of leaders as gospel admitting of no question, that they endure uncomplainingly torturing inconveniences, all because George Stephenson and other engineers perpetuated the stage coach on railways and made the people believe it was for their glory and comfort.

Readers of Scott, Dickens and other novelists who describe graphically and truthfully the habits and customs of people in the British Isles in the days anterior to railways, cannot fail to be impressed with the attraction and romance associated with the stage coach. On the fine roads traversing the whole country, this method of getting over the world had many delights peculiar to itself. Old American travelers also remember something about stage coaches, but it is only distance that lends enchantment to that view. The necessity for getting out and wrestling with a fence rail to help the coach out of a slough occurred too often for novelty or pleasure.

In later days, when it became the fashion to see the Wild West or the Rocky Mountains from a stage coach, the experiences were too exciting to be attractive except as a reminiscence—one of the kind a man did not hanker to repeat. All of us remember Horace Greeley's famous stage coach ride, and some of us remember others less famous that are not likely to be forgotten in a hurry by those who participated. My last stage coach ride was from South Park to Leadville, and the mining passengers described Jim the driver as being in fine trim, for he was drunk enough to forget fear. As his Dutch courage led him to drive the eight mules at full gallop round giddy precipices on a narrow shelf that served as a road, some of us wished that Jim was slightly less inspired with that kind of valor. The driver seemed to have also imbibed a sense of humor from his whiskey, which was displayed in making the wheels strike every boulder that lay near the path. When a coach thundering down a hill strikes a boulder three feet high it stirs up the passengers. We were so freely stirred that about once every thirty seconds our heads nearly bounced through the top of the coach. With such men in charge it was not surprising that the coach broke down before we reached the pass. When we got going again after two hours delay, and toiled slowly up the mountain at night with the forests around us on fire, and emerged on the treeless "divide" into a raging snow storm in September, it was not surprising that we got thrown in a heap by the coach overturning. Leadville was reached about daybreak with no other accident than the driving into an old "claim" and leaving the front near mule in the hole.

That was not the kind of coaching done in merry England in the olden time. The roads were faultless, the horses were the best of their kind, and if the driver got drunk on the good ale supplied at the numerous wayside inns, there were few precipices to jeopardize the necks of men and cattle. The coach was gaily painted, the guard was decked in imposing livery, and bravely tooted a reverberating horn as the cavalcade thundered into the village or the yard of the King's Arms. The passengers were proud of the outfit and appreciated the efforts of mine host to provide his best for regaling the inner man. Driving through the green fields and fragrant hedgerows, or under the grateful shade of umbrageous woods, made traveling a protracted pleasure jaunt in fine weather; and the discomforts of being cramped in a stifling box and half frozen during a winter journey made little impression. When the proposal was made to build railways, one of the strongest objections against it was that the new method of transportation would ruin stage coach business. The bucolic member of Parliament considered that a very serious objection, indeed, and as railways could not be opened without permission from Parliament, all sorts of innocent deceptions were resorted to in order to convince country members that the stage coach which was popularly regarded as a pillar of the constitution was not in danger.

Stephenson and his contemporaries proposed to make the railway train merely an accelerated stage coach. To make the delusion complete, real stage coaches were placed on flanged wheels and run on the railway. The English railway carriage of to-day is merely the stage coach enlarged, enrailing all the disadvantages of stage coach travel with none of its cheering advantages. All the ordinary passengers are provided with seats occupying the least possible amount of room. He gets into that seat, and if the compartment is full, he must sit there stiff and upright to the end of the journey or till the train stops at a junction or other important point, when he may venture out to relax his stiffened joints and "brace up" in the refreshment room if he feels so inclined, and he generally does. The compartment car is good for the railway company, since it enables them to crowd passengers into limited space, and it is endurable for an hour's journey, but it is simply cruelty to animals to crowd men and women into these places for a journey of eight or ten hours. Yet there is more agitation against keeping steers in railway cars without food and water during long journeys in America, than there is against penning human beings up in the same way in Britain.

One of the most uncomfortable journeys I ever made was a night run from Manchester to Glasgow. Passengers anxious to procure enough room in the carriage to stretch out their legs, can generally do so when the train is not crowded, by tipping the guard, who will keep other passengers out of that compartment. As there was no sleeping car on the train, and as I wished to travel as comfortably as circumstances would allow, I decided in an evil hour to tip the guard, and he was altogether too accommodating, for he admitting no other person to the compartment. The weather was pleasant enough in Manchester, but when the train got up into the Cumberland hills it was like making a plunge precipitately into winter, and my American summer clothing were of little value for such temperature. I have gone through a good many hard blizzards in the West, and have spent several nights blocked up in snow-bound trains, but I never suffered the half from cold I did on that solitary journey over the border. The only relief, and it was of the most unsatisfactory kind, was to run out at the stopping places and fill up with a vile decoction and deception termed hot coffee.

This journey in passing over the rough hill country be-

tween England and Scotland led round sharper curves than are usually encountered in English railways, and more of them. The train was hammered along as if the driver intended getting there on time, and the observant too awake passenger had no difficulty in locating each curve, for the short car with its long rigid wheel-base bumped against the outside rail and lurched as if it intended trying the ditch. The English railway car, or carriage as it is called, is a triumph of development in an unbroken line from the most elementary forms. The most primitive form of carringe was two parallel rails, the load being carried in the middle, a man at each end being the beasts of burden. This is called the hand-barrow in the district where railways originated. An improvement of this vehicle was placing a wheel at one end, when it became a wheelbarrow. The miners who raised coal in the north of England made heavier rails, put a pair of wheels at each end and a box on the top, and they had got the coal wagon. That is the English railway freight car of to-day. To make a passenger carriage, the early engineers used a stage coach body instead of a box. The rails formed the sills of the developed car and their ends were convenient bumpers for pressing against connecting cars. As a solid wooden bumper produced too violent a shock when two cars came together with any degree of force, spring arrangements were applied to soften the concussion. The coupling is in the middle, and is a right and left hand screw drawing two links together. The train is screwed up as tightly as possible to keep the various cars from vibrating, but a tightly coupled train offers great resistance on a curve, owing to the point of contact being so far away from the point of coupling. The side buffer system is really one of the most expensive features of the British car, but to change it would be an innovation, and innovations are not popular here. It is always considered much more meritorious to enlarge or adapt an old device to a new purpose than to invent something original. The Hindoos, or some other Oriental people, are so fond of holding to the true line of development that their immense marble temples are merely enlarged tents. There is a surprising amount of the same sentiment all through Old England. It is apparent not only in the inconvenient railway machinery, but in the methods followed and appliances used in every shop in the kingdom. The preachers and clerical writers abuse and ridicule Darwin's development theories, but the daily habits, walk and conversation of the English people speak volumes in favor of his principles.

ENGLISH LOCOMOTIVES.

American engineers traveling in Britain are certain to be struck with the great diversity of locomotives used for pulling passenger trains. The most common style of locomotive met with is inside connected, having two pairs of driving wheels coupled and placed in position similar to the driving wheels of an ordinary American locomotive, the front end being carried by one pair of leading wheels about 42 inches diameter. Even in this style of engine great diversity in the arrangement of the motion is noticable on different engines. In some cases this kind of locomotive has the front end carried on a four-wheeled track denominated a bogie. Next in point of numbers appears to be a locomotive with a single pair of drivers in front of the fire-box, the front and back ends being supported by leading and trailing wheels about 42 inches diameter. This kind of engine is sometimes designed with inside cylinders, but the greater part I saw were outside connected. A considerable proportion of two-wheel connected locomotives have outside cylinders. In addition to the types mentioned there were many locomotives of a nondescript form, such as the Stroudley engines, that have two pairs of coupled driving wheels in front, and the various kinds of compound locomotives having two or more cylinders with connections to suit.

There is not so much diversity in the form of freight locomotives. A six-wheel coupled inside connected engine, with all the weight resting on the drivers is found on nearly all roads.

Passenger locomotives all have what would be regarded in America as large drivers, six feet being about the smallest diameter, and seven feet being very common. A few engines are seen with drivers eight feet diameter and over, but these are not common.

For the same cylinder capacity, the boilers of British locomotives differ very little from American practice. The fire-boxes are all copper and the tubes mostly brass, the diameter of the latter being commonly about 1¾ inch.

Brass and other alloys are greatly used in British locomotive construction, and the practice is, to some extent, accountable for the high cost of these engines. Axle boxes, slide valves, eccentric straps and many other parts are made of brass or bronze, but there is beginning to be a tendency on a few lines to follow the American practice of employing cast-iron for these purposes. I talked one day to a division locomotive superintendent about the wear of brass rubbing parts, and he mentioned a case where he had extreme trouble with an engine's valves. They were bronze valves and usually wore out in three months. He applied for a set of cast-iron valves and got them. The engine had then run over a year with the iron valves, and they were still in good order. It is a significant indication of the conservative tendency of the mechanical department of that road, that the valves referred to are the only cast-iron valves in use, and there is no likelihood of more being tried soon.

A conspicuous feature of British locomotive construction is the great quantity of riveted plates used. The engine is encompassed in an outside framing composed of thin plate riveted to angle irons, the limited cab used, and most casings are riveted plate, and where trucks have been adopted girders of riveted plate take the place of our forged bars. In looking round shops where repairing was going on, I found that a considerable amount of the work done was caused by the tendency of rivets to work loose. While riding on fast running engines, I noticed that the plate casings vibrated at a great rate, making the engines very noisy.

The practice of closing in all the working parts by casings vastly increases the expense of repairs without performing any useful functions. The early English locomotive engineers supposed that closing in the working parts at the sides would prevent dust and grit from getting in, but it was a fallacy. The grit that injures the motion comes up from below, and nothing can be done to exclude it in that direction. Owing to the practice of using these casings, many repairs that can be effected on an American engine in an hour or two can not be done on an English engine in less than a day.

In the designing and building of American locomotives every possible foresight and care are exercised to perfect the convenience and provide for the comfort of the enginemen. In designing English locomotives the comfort or convenience of the man handling the engine appears to receive very little attention. This must exert great influence on the durability of locomotives. An American engineer can go round the outside of his engine and oil every part and see every key and bolt that it is important to watch on the road. An English engine driver has to creep below the engine to oil certain parts, and very little of the motion can be seen unless he goes below to look at it. The men who have exercised the greatest influence on the details of American locomotive construction have been in the habit of running the engines and knew from experience what was wanted; engine drivlng in England is regarded as a menial employment, and it is doubtful if there is a single locomotive superintendent in Great Britain who could take an express train over the road on time, so they do not realize the advantages of making things convenient for the driver.

From reading British engineering journals, I had supposed that the practice of building inside connected locomotives was on the wane, but my visit to various railway centers showed that I was mistaken. Instead of decreasing the percentage of inside connected locomotives it is increasing rapidly. Many terribly disastrous accidents have been caused by crank axles breaking on the road, and there is no indication that engineering skill will ever produce an axle of this character that will be free from danger. An inside-connected locomotive is more expensive to build, requires more repairs, and is more difficult to effect repairs on than an outside connected engine. It might be expected that the inside cylinder engine must possess some conspicuous merit peculiar to itself to compensate for its numerous shortcomings, but I have failed to find any. On questioning the advocates of inside engines about the peculiar merit of their favorite, we are told that the engine rides steadier than those that are outside connected. That is all. Yet the correctness of the conclusion is doubtful. It looks to me to be principally a question of counterbalancing. Take two locomotives, one inside, the other outside connected, both badly counterbalanced, and that with the inside cylinders will ride steadiest, but my experience as an engine runner is that an outside connected locomotive properly counterbalanced and the cylinders firmly fastened, runs just as steady as any motor on wheels. A badly counterbalanced outside connected locomotive carried in the front end by a single pair of leading wheels, nearly always oscillates across the track when running. If a similarly defective engine has a four-wheel truck in front it oscillates lengthwise of the track, making the couplings jerk. Many English outside connected locomotives have the cylinders weakly fastened between the frames, which induces movement that becomes oscillation. They do not cast their outside cylinders to bolt together on a solid casting, but connect them by means of wrought iron girders. The inside cylinders, on the other hand, are made to bolt together, and it appears to me that some of the steadiness claimed for this form of engine is due to the superior fastening of the cylinders. The slab frame universally used on British locomotives may be responsible for some of the unsteadiness complained of with outside cylinders, since they admit of more lateral movement than is possible with a good bar frame.

Counterbalancing of locomotive driving wheels has received too little attention from British engineers. The Clark formula for counterbalancing is accepted as satisfactory, and is used by most builders. American locomotive builders and master mechanics found long ago that the Clark figures gave indifferent results, and better methods have been reached by a tentative process. There appears to have been little or no effort made in Britain to improve on Clark's plan, and so little attention is paid to the subject that nearly all engines with wheels under five feet diameter are run without any counterbalance weights whatever. The mechanical officers say that counterbalancing is not necessary with slow-running locomotives, an opinion that will be accepted by American engineers as rather untenable.

While loitering round the London & Northwsstern station at Liverpool, watching the methods of receiving and dispatching trains, I was struck with the locomotives as having the peculiarities of a very soft and and extremely irregular exhaust. It seemed certain that the engines must have a very profuse heating surface to make steam freely with the weak exhaust that indicated a wide nozzle, but further investigation convinced me that particularly good coal had most to do with it. The soft exhaust was confined to engines using a fine steaming quality of Welsh coal. Where locomotives burned Scotch coal, which is about equal in calorific value to the ordinary Western American coal, the exhaust of the engines was not apparently different in intensity from that of our locomotives having a single nozzle. The irregular or lame exhaust, seemed, however, to be the rule with British engines. Indeed, I did not hear a single locomotive exhausting in a way that an ordinary American locomotive engineer would be satisfied with, and many of them sounded as if they had a slipped eccentric. The straight link is very much used, but the exhaust of the locomotives from Wick to Portsmouth appear to proclaim that it is a doubtful improvement over the shifting link universally used in America.

The average British locomotive does its work fairly well on the fine roads it is designed for, but it is more expensive for repairs per mile run than an American engine is in doing the same work, and the superior economy in the use of fuel claimed for the engine is very much of a fallacy. The English engine nearly always pulls a very light train, is got into speed slowly, and seldom has to have the steam shut off between wide apart stopping points. If one of Mr. Stroudley's much-vaunted locomotives had to run the Chicago limited express over the Lake Shore road, I am persuaded it would burn as much coal as any of Mr. Stevens' latest engines do. The heavy engines that run the suburban trains on the underground and North London railways, would have to do much livlier work than they are accustomed to, if they tried to take an ordinary train on the elevated railroads of New York over the road on time, and neither of these engines could begin to handle the suburban trains on the Illinois Central Railroad at Chicago. The reasons for this faith I shall give in future letters.

A. S.

Committees of the Master Mechanics' Association.

We have received from Mr. J. H. Setchel, Secretary of the Association, the following List of Committees and the subjects upon which reports are to be made at the twentieth annual meeting to be held in June, 1887:

1. *Proportion of Locomotive Cylinders:* To give the best results, what rule should be followed for proportioning the cylinders of an engine, when the size of driving-wheels, weight available for adhesion, and boiler steam pressure are given quantities. CHARLES BLACKWELL, Union Pacific R. R.; F. L. WANKLYN, Grand Trunk Ry.; T. E. BARNETT, Canadian Pacific Ry.

2. *Traction Increasers:* Their various types and relative merits; also, cases in which their use can be recommended. R. H. BRIGGS, Ches. Ohio, So. Western Ry.; D. O. SHAVER, Pennsylvania R. R.; T. J. HATSWELL, Flint & Pere Marquette R. R.

3. *Cross-Heads and Guide-Bars:* The various types in use, the materials and their construction, and results obtained. F. M. DEAN, Cambridgeport, Mass.; H. W. HOWSON, Cumberland & Pennsylvania R. R.; J. B. HENNEY, New York & New England R. R.

4. *Packing:* The various forms of piston packing in use, and obtained results. Also, the most economical and satisfactory packing for piston rods, valve stems, regulator and air-pump stuffing boxes, with results obtained. J. W. STOKES, Ohio & Mississippi R. R.; ALLEN COOKE, Chicago & Eastern Ill. R. R.; HENRY SCHLACKS, Illinois Central R. R.

5. *Locomotive Preparation:* Washing and lighting up locomotives, showing the best system in use for washing out, and most economical and expeditious mode of raising steam in firing up, and the necessary plant for same. G. W. ETTENGER, Ches. & Ohio R. R.; W. H. THOMAS, East Penn. Va. & Geo. R. R.; T. W. GENTRY, Richmond & Danville R. R.

6. *Coaling up Locomotives:* The various plans in use, and their relative cost and efficiency. J. DAVIS BARNETT, Grand Trunk Ry.; JAMES STRODE, Northern Central Ry.; CHARLES GRAHAM, Del. Lack. & Western R. R.

7. *Standard form of Tire Section:* J. N. LAUDER, Old Colony R. R.; JACOB JOHANN, Chicago & Atlantic Ry.; H. N. SPRAGUE, Pittsburgh, Pa.

8. *What Control has the Engineer over the wear of Driving Wheel Tires?* JOHN MACKENZIE, New York, Chicago & St. Louis Ry.; J. S. GRAHAM, Lake Shore & Mich. So. Ry.; FRED. B. GRIFFITH, Del., Lack. & Western R. R.

Associate Members to Read Papers: F. B. MILES, ROBERT GRIMSHAW.

Obituary Committees: On Death of M. M. Pendleton.—C. W. Walker, Seaboard & Roanoke; J. F. Devine, Wilmington & Weldon; James McGlenn, Carolina Central. On Death of George E. Boyden.—J. N. Lauder, Old Colony; Geo. Richards, Boston & Providence; Jos. M. Whitlock, New Haven & Derby. On Death of S. H. Dotterer.—R. C. Blackall, Delaware & Hudson Canal; H. W. Eddy, Boston & Albany; O. Stewart, Fitchburg. On Death of J. C. McCune.—J. S. Turner, Mexican Central; H. P. Olcott, Atchison, Topeka & Santa Fe; A. H. Watts, Texas Pacific. On Death of John Ivanson.—Jas. Patterson, Cin., Ind., St. Louis & Chicago; E. A. Campbell, East & West Texas; Jas. Meehan, Cin., N. Orleans & Texas.

General Supervisory Committee; Printing and "Boston Fund."—WM. WOODCOCK, JACOB JOHANN, R. H. BRIGGS, GEO. RICHARDS, J. H. SETCHEL.

Standing Committee on Subjects: T. B. TWOMBLY, Chicago, R. Island & Pacific Ry.; CHAS. BLACKWELL, Union Pacific R. R.; GEO. HACKNEY, Atch., Topeka & Santa Fe R. R.

Arrangements for Next Annual Meeting: GEO. W. CUSHING, Northern Pacific R. R.; CLEM. HACKNEY, Union Pacific R. R.; R. W. BUSHNELL, Bur., C. Rapids & Northern Ry.

THE Chicago, Burlington & Quincy road are equipping 50 of their cars at the Peninsula Car Works, Detroit, with the Ames coupler.

Edinburgh International Industrial Exhibition.

(EDITORIAL CORRESPONDENCE.)

EDINBURGH, July, 1886.

The ancient city of Edinburgh possesses so many historical and scenic attractions that it is peculiarly well adapted for the holding of exhibitions, very small extra attraction never failing to draw crowds of visitors. But the promoters of the International Industrial Exhibition now open in the capital of Scotland did not rely on outside attractions to make their show a success. It is one of the most interesting, well-arranged and attractive exhibitions we have ever visited, although much smaller than many of the kind that have proved less worthy of notice.

Although Edinburgh is not a manufacturing city itself or much identified with industrial interests, it is conveniently situated for reaching the places where the leading industries in Scotland are carried on, and the exhibition represents the country's productions very fairly. As Scotland is noted for the extent and variety of machinery produced, the exhibition naturally contains a large machinery exhibit. In looking round the various sections, inspecting the machinery and comparing it with American productions of the same kind, we had no reason to feel that the old country machinists were ready to instruct our manufacturers to any great extent. The Scotch machinery, as a rule, is heavier than ours, and greater attention is paid to exterior finish, but the parts requiring accuracy are not better made than our own. In the line of machine tools we were surprised to find a great deal of gearing in the form of rough castings. Those who use machine cut gears were disposed to direct attention to the same as if it were an acknowledged novelty.

An attractive feature about the exhibition is the machinery in motion. Visitors were able to stand around and watch all sorts of industrial operations going on, and the work appeared to excite intense interest, for the machinery courts were constantly crowded by people who seemed never to tire looking at material changing from the raw to the finished condition. The courts where this work was going on covered 13,000 square feet. Four lines of basic steel shafting, each 274 feet long, were used in transmitting power to the machinery. Engines aggregating 1,400 horse-power were used in driving the machinery and electric lighting dynamos. Steam is supplied to the engines by six boilers each of different form, made by different makers, one being an American sectional boiler made by Messrs. Babcock, Wilcox & Co., fo New York. This boiler is of 136 horse-power capacity, and is fitted with a chain grate mechanical stoker, the operation of which excited no small interest among engineers. The only articles of American manufacture that have a conspicuous place in the exhibition, are sewing machines and organs. In some of the stalls American watches and clocks were displayed, but they were poorly represented considering the numbers sold in shops. The American watch must be largely sold in Britain, for we saw several large shops where they were the principal attraction in the windows, and at one large shop in Argyle street, Glasgow, there was nearly always a crowd of people looking at the American watches and talking about their cheapness and good qualities. As all the watches in that shop were of the kind usually sold in American for about one dollar, we were rather surprised to hear about their good quatities.

Although we were profoundly interested in watching the development of beautiful patterns in the silk looms and other indnstrial operations, we hardly expected that the readers of the NATIONAL CAR AND LOCOMOTIVE BUILDER would care for descriptions of the same, so we devoted the greater part of our attention to the exhibit of railway machinery. In this department the principal attraction was four locomotives, all exhibited by railway companies, although three of them were made in contract shops. Railway companies in Britain appear to be very enterprising in exhibiting their machinery, for nearly all the railway appliances in the Liverpool Exhibition and in the Colonial Exhibition at London, are shown by railway companies.

In looking over the railway appliances at an exhibition of this kind, the first thing that strikes one accustomed to American exhibitions is the absence of car couplers. We missed the cordial invitation of the car-coupler man to come and examine the best car coupler ever invented. By persistent searching we found two car couplers in the Edinburgh Exhibition, but they were so wonderfully unlike anything seen on our side of the Atlantic that we hardly recognized them, and the men in charge lacked the persuasive eloquence by which American inventors excite the interest of every visitor. The British "goods wagon," as the freight car is called, couples on a large hook by a chain of three links—the crudest kind of a way of connecting vehicles together. There are two points of contact at the end of each car, a bumper at each side. The couplings have from eight inches to a foot of slack. The usual way of coupling this arrangement has been to go between the cars and then climb up over the bumpers. Coupling English wagons is more dangerous than coupling American cars, but public sentiment there is making no demand for safer methods, so practically nothing is being done to introduce improvements.

As we go up the hall where most of the railway machinery is placed, the first attraction we reach is an outside connected locomotive, built by the Clyde Locomotive Company for the Highland Railway. This engine is not unlike the ordinary American eight-wheel locomotive, as it has four driving wheels coupled and a four-wheel truck. The cylinders are inclined like those of most British outside connected engines, and the truck is a very heavy concern, made of ponderous plates riveted together. Like nearly all the outside cylinder locomotives in Britain, it has very short connecting rods, the length being under six feet. This feature of design is due to a desire to keep the cylinders as near the driving wheels as possible, with the view of keeping down the weight in front. The wheels, springs and motion of the engine are cased in by an outside plate iron frame, whose principal object is to give as much work as possible to machinists when a job of repairing has to be done.

The next engine in order is a single driver passenger engine built by Messrs. Nelson & Co., of Glasgow, for the Caledonian Railway, and intended for fast, moderately light business. The cylinders are 18×26, and the driving wheels 84 inches diameter. The front end is carried on a truck and the back end by a pair of small wheels under the foot-plate. The word small is used as comparative of size of driving wheels, for to our notion the carrying wheels are all very large, being about 42 inches diameter. The truck wheels are about that size. There appeared to be half as much work about this truck as there is about the whole of an American engine. The center has a lateral movement and is kept central by springs on each side of the pin. All the axle boxes of the engine are brass. The connection of parts of the engine is designed to be interfered with very seldom. To put new packing in the cellars of the engine trucks entails the jacking up of the engine and the taking down of the pedestal brace. The slab frames of this engine are 1¼ inch thick and very deep, so that they must be about as rigid as our bar frames, and they are still further stiffened by a heavy steel casting called a spectacle yoke, which is bolted between the two frames and supports the back end of the guides, and is an attachment for other parts of the motion. The driving boxes are immense brass castings working in very wide pedestal jaws without any wedges. Some British locomotives are now made with wedges to take up lost motion, but it is generally regarded as a new-fangled Yankee device that deserves little patronage. As an engine-house foreman put it, "We don't want changes made that are to take the living of our mechanics away."

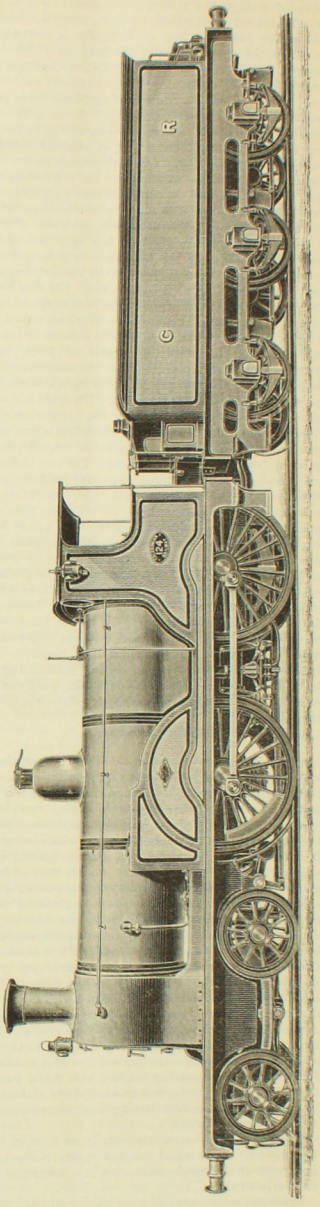
This engine had two rows of rivets in her mud-ring and a close ash-pan with castings round the openings. The damper doors could be closed in a way that was practically air-tight, so they deserved the name of dampers.

One thing that has impressed us at the British exhibitions is the stupendous ignorance and stupidity of the men in charge of the railway machinery. At American exhibitions the men in charge can be relied on to give all particulars about the dimensions and material of the machinery they are looking after, but at British exhibitions the attendants rival each other only in knowing nothing. This density of ignorance is not confined to the kind of men kept for polishing up the machinery. There was a man from the office of Nelson & Co.'s exhibit, and the only way he appeared to distinguish himself beyond the other attendants was in adding incivility to ignorance. His knowledge was like the Dutch skipper's anchor, it was all at home with his drawings. The valve travel, the size of ports, the dimensions of steam and exhaust pipes, the number of tubes and many other particulars that we wanted to know, he would be perfectly ready to give if he had the drawings, but as these folios of knowledge were absent, he was to the inquirer dumb like the lamb before the shearers; yet he opened his mouth occasionally, and put his put his foot in it, so to speak. In looking round the engine, we ventured to question the utility of making wheels seven feet in diameter. Then this representative of one of the largest locomotive works in Britain said large wheels were not needed in America, because trains were never run more than thirty miles an hour. To our remark that trains could be found any day between New York and Philadelphia running over a mile a minute, he bluntly said he did not believe a word of it.

The other engines in the exhibition was an eight-wheel engine, built by Messrs. Dubs & Co., Glasgow, for the Caledonia Railway, which we illustrate and describe elsewhere, and an eight-wheel engine with cylinders 18 × 26 inches, built at the North British Railway shops, for the heavy fast passenger business of the road. There is nothing specially novel about this engine.

In another part of the building the North British Railway Company exhibit a very handsomely finished and gorgeously upholstered first-class carriage, 38 feet long, carried by six pairs of teak wheels. That material appears to be gaining favor in Britain for wheel centers. It is said to have all the advantages of paper, while being considerably cheaper. Some of those wheels we saw in service looked shrunken and seamy.

RAILWAY returns that have just been published in England report that the iron axles that have failed averaged 238,444 miles of work, while the steel axles that failed averaged 236,296 miles of work. The excess in favor of steel is not very great, but it is said to have caused a good deal of jubilation among the steel makers.



PASSENGER LOCOMOTIVE FOR THE CALEDONIAN RAILWAY (SCOTLAND).

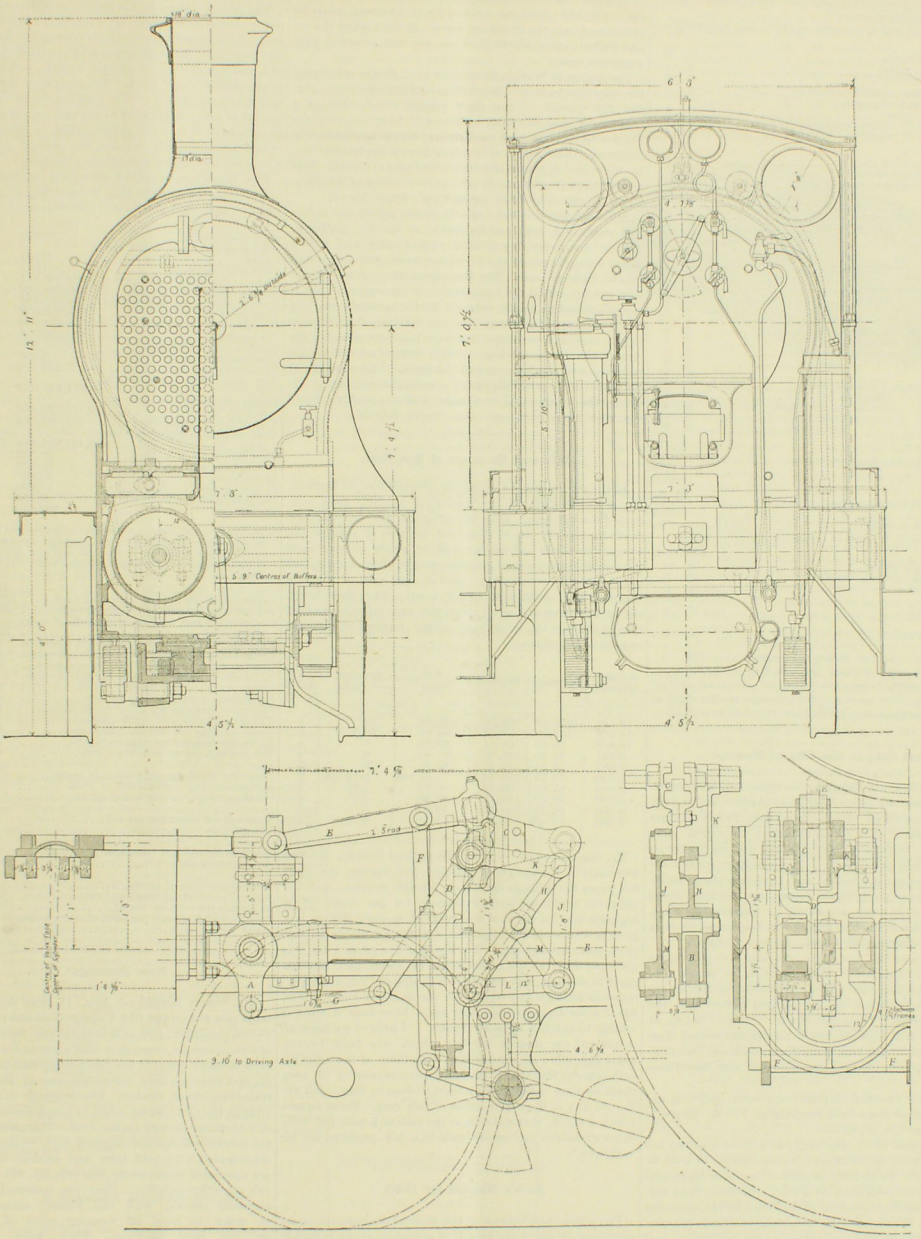
The engravings illustrate a locomotive which was shown at the Edinburgh Exhibition, where it attracted great attention from visitors interested in railway engineering. The cuts were supplied to us by *Engineering*, of London, and the following particulars regarding the engine were published by our contemporary:

The engine and tender were built by Messrs. Dubs & Co., of the Glasgow Locomotive Works, for the Caledonian Railway Co. The engine is of a class designed by Mr. D. Drummond, the Locomotive Superintendent of the line, to work the Royal Mail train between Carlisle and Aberdeen, a portion of the railway where the gradients are long and heavy. As will be seen from the engravings, it has two pairs of coupled wheels 6 ft. 6 in. diameter and a four-wheeled bogie in front, with wheels 3 ft. 6 in. in diameter. The frames are brought together a little in front, to clear the front wheels of the bogie in their action in passing around curves. As the engine has cylinders 19 in. in diameter, with 26-in. stroke, the tractive force which it is capable of exerting is $\frac{19^2 \times 26}{78} = 120.3$ lbs. for each pound of effective pressure per square inch on the pistons.

The boiler is of the usual type; the barrel is constructed of two plates in length, the fire-box being flush with the boiler. The crown of the copper box is stayed to the outer shell by five curved wrought-iron girders of "bridge rail" section. From these are slung cast steel link brackets, through the bottom flange of which the suspension stays pass to the roof of the copper box. This arrangement permits the free expansion of the copper box.

PASSENGER LOCOMOTIVE FOR THE CALEDONIAN RAILWAY.

Constructed by Messrs. Dübs and Co., Glasgow, from the Designs of Mr. D. Drummond, Locomotive Superintendent.



A dome is placed in the middle of the first barrel plate in front of fire-box, and is surmounted with a pair of Ramsbottom's safety valves. It contains the regulator of a gridiron type, with a small easing valve at the back. The ashpan has double doors with cast-iron frames and doors. The fire door is also of cast-iron

The cylinders are placed inside the frames, and the pair are in one casting, the valves being on the top; the centers are thereby brought closer together, allowing an increased strength to be given to the webs of the crank axle. The slide bars are of cast-iron, of the box pattern, which protects the wearing surfaces from dust.

The valve motion is one patented by Mr. Bryce Douglas, of the Fairfield Engineering and Ship-building Company, this being its first application to a locomotive engine. It gives a very even distribution of steam. This gear is shown in detail in the engravings. Referring to these views it will be seen that the crosshead *A* has coupled to it a connecting-link *G* which connects it to the lower end of the vibrating rod *D*, which oscillates on fixed centers near its upper end. Above these fixed centers the rod *D* carries a curved expansion link *C* fitted with the usual sliding block. To this block the valve spindle is connected by the valve connecting-rod *E*, the position of which is controlled by the lifting links *F* and the reversing gear. In addition to being carried bodily to and fro by its connection with the vibrating rod *D*, the expansion link *C* has an oscillating motion imparted to it through an arm at the back of it being coupled to the driving link *J*. The lower end of the driving link *J* has two attachments, namely, first by the connecting link *L* to a fixed point, and, secondly, by the connecting link *M*, to an intermediate point on the driving rod *H*, the lower end of this driving rod *H* being coupled to a point on the connecting-rod of the engine, while its upper end is controlled by the supporting link *K* which connects it to a fixed center. From the foregoing description the action of the gear can be readily traced out. The reversing gear has a vertical screw, and is placed on the left-hand side of the engine.

The frames of the engine are of Yorkshire iron. The axle-boxes are of gun-metal, sliding in adjustable cast-iron guides fitted on both sides of horn-blocks. The load on the driving wheels is carried on four Timmis' spiral springs, while the load on the hind wheels is supported on laminated springs with 3 ft. 6 in. centers. The bogie has laminated springs with 4 ft. centers.

The engine is fitted with a powerful air brake on the Westinghouse automatic (pressure) system, which acts between the driving and trailing wheels. The Westinghouse air-pump is on the right-hand side, the reservoir being placed under the hind platform. Two cast-iron sand-boxes, forming part of the driving splashers, are supplied with sand cocks worked from the foot-plate. Two organ whistles are used instead of the ordinary kind. The engine is also fitted with two injectors, two sets of glass water-gauge apparatus, and one of Bourdon's duplex pressure gauges.

The axles of both engine and tender are of Yorkshire iron, while the engine tires are of crucible, and the tender tires of Bessemer steel. The centers of both the bogie and the tender wheels are steel castings, while the centers of the coupled wheels are of wrought iron.

The tender has six wheels, each 4 ft. in diameter, and carries 2,840 gallons of water and 5 tons of coal. It is clothed with sheet iron ⅛ in. thick, and has an air space of ⅜ in. between the upper tank plates and the casing. The tank has a well which

forms part of the inner frame. The framing is of "Siemens steel." The tender is fitted with a hand brake in connection with the Westinghouse brake, the arrangement being such as to permit of separate or combined action.

The chief dimensions of the engine we have been describing are as follows:

	Ft.	In.
Cylinders and Frames:		
Diameter of cylinders	1	7
Stroke "	2	2
Distance between centers of cylinders	2	0
The "Douglas" valve gear—		
Outside lap of valves	0	1
Distance apart of frames for greater portion of length	4	1⅛
Distance apart of frames at front ends	3	11⅛
Wheels and Axles:		
Diameter of coupled wheels	6	6
" bogie wheels	3	6
" bearings, crank axle	0	8¾
Length of " " "	0	8⅞
Diameter " hind "	0	7⅛
Length " " "	0	7⅛
Diameter " bogie "	0	6
Length " " "	0	9
Boiler:		
Length of boiler over all	16	5⅝
" " barrel	10	3⅛
Diameter of boiler inside	4	4
Length of fire-box casing	6	2⅝
Width " " at top	4	7⅛
" " " bottom	4	0⅞
Length of smoke-box inside	2	9
" " copper fire-box inside at top	5	4
Depth of copper fire-box at tube-plate	6	2
" " " " door	5	8
Width " " "	3	5
Thickness of plates, fire-box casing	0	0⅝
" " boiler barrel	0	0⅜
" " smoke-box tube-plate	0	0½
" " copper fire-box	0	0⅜
" " tube-plate	0	0⅝

	Sq. ft.
Heating Surface:	
Tubes 216 of 1¾ in. diameter = area	1,047.2
" 10 of 1½ " = "	41.5
Fire-box = "	122.0
Total heating surface	1,210.7
Grate area =	19.5
Working boiler pressure 150 lb. per sq. in.	

Distribution of Weights in Ordinary Working Order.

	Tons.	Cwt.
Engine:		
Weight on bogie wheels	14	12
" front driving wheels	15	5
" hind " "	15	3
Total	45	0
Tender:		
Weight on six wheels	30	0
Total weight of engine and tender	75	0

Altogether the engine we have illustrated is an excellent example of the powerful locomotives which our main lines now require for working their heavy and fast passenger traffic, while as a specimen of workmanship, it does great credit to its builders.

Street Cars in the City of Mexico.

The District Railway company operates 150 kilometers of track, or about 93 miles English measure. Its rolling stock consists of about 139 first-class cars, 65 second-class cars, 46 platform cars for transporting furniture, merchandise, etc., 26 funeral cars, and 26 wagons for transporting material and fodder. The company owns 1,500 mules, eight estates in the city, and twelve in the suburbs. It transports nearly 10,000,000 passengers yearly. Fares range from 3 to 23 cents, according to distance and class, but in the limits of the city proper the first-class fare is 6¼ cents, or a medio equal to 5 cents American money.

The divisions of the cars into first and second classes will be noted. This is an excellent idea, for people who want good company pay double what those particular are charged. The first-class cars are painted yellow and the second-class green. These cars run in "trains" of two or three. There is always one first-class and one second-class car in a "train." On long distances sometimes two first-class and one second-class car are run, and sometimes four cars.

The hours for running cars are from early morning until 9 P. M., and on some lines stopping at 7 P. M. There is no all-night service anywhere.

There are a few short open cars, but a great majority are closed cars, with the windows down except in cold or rainy weather. Everybody smokes as much as he pleases on any car, from conductor to driver. Smoking is so universal here that a prohibition of smoking would make the people rise in revolt. Sometimes, I regret to say, the conductor has a novel, and reads slyly, to the neglect of passengers hailing his car from the sidewalks. The conductors do not take up tickets, but these are gathered by inspectors, who board the cars at regular stations, and after collection, make a comparison of books with the conductor. This system is said to work very well.

Conductors are paid from $1 to $2 per day; inspectors, $1.50; drivers, 75 cents. Deduct from this 20 per cent. to get the equivalent in American currency. This would make the pay of a driver 60 cents.

The city lines are 14 in number, and there is a system called the "circuit" system—not exactly a belt railway, but a system of narrow-gauge tracks running away through the city, up one block and down another. These lines go east, west, north and south, and really form a useful feature of the system. There are seven narrow-gauge circuit roads.

A novel and very useful feature is that of platform, and even box cars, in which furniture or goods are moved from point to point. Pianos are largely carried in this manner, and costly mirrors and such fragile goods. A platform car, to a point four miles out, costs but $3 or $2.40 American money. Six dollars pays for a service to the distance of 12 miles. Not over 7,000 pounds are allowed on a single car. I should think this feature might advantageously be introduced into the street car service of the United States, especially in cities where the lines are not crowded with passenger cars.

The tourist in Mexico frequently sees, slowly traversing the city streets, black, lugubrious-looking platform cars, and the canopy of the same somber color. This is a funeral car, and following it there will be one or two cars filled with mourners, all on their way to some neighboring cemetery. The coffin is in plain site on the funeral car. In the case of young children white cars are used. This service costs from $4 to 12 per car, according to the class, and is the usual mode of conducting a funeral here.

Although the etiquette of a Mexican street car is free and easy, and men smoke inside or on the platform, women are invariably treated with respect, and half a dozen men will get up and give place to any woman, young or old, rich or poor. The Mexican gentlemen has all the courtesy for which the Latin races are famous, and life is smoothed and its angles rounded by the constant courtesy of this most polite nation. Do not imagine that because people smoke in the street cars their interiors resemble the American railway smoker—all filth under foot and the air befouled with rank cigars and old pipes. The windows of the car being generally open, a constant current of air drives the smoke out of the car, and one hardly notices that smoking is going on.—*Cor. Boston Herald.*

Life and Earnings of Box Cars.

At the recent Car Accountants' Convention, at Buffalo, Mr. E. C. Spalding, of the Western & Atlantic road, presented the following table showing the average mileage made by the box cars of that road, the cost of repairs, the average earnings and the per cent. of profit or loss each year during ten years of general service. The earnings are based on ¼ of a cent mileage, and the per cent. of profit is based on $500 as the first cost of a car. The interchanging of daily reports of movements and mileage enabled him to compile the table from actual returns of mileage instead of estimates:

Average Mileage.	Earnings.	Repairs.	Net Profit.	Per cent. of Profit.	Ages of Car Years.
13,149	$98.62	$9.58	$89.04	18.	1
13,478	101.08	38.13	62.95	12.5	2
10,475	78.56	48.24	30.32	6.	3
9,847	73.85	45.85	28.00	6.	4
9,881	74.11	57.31	16.80	3.	5
9,349	70.12	70.74	.62 loss	0.14 loss.	6
8,968	67.26	60.74	6.52	1.25	7
9,250	69.37	55.49	13.88	2.75	8
9,295	69.71	49.80	19.91	4.	9
7,656	57.42	53.67	3.75	0.75	10

Mr. Spalding says: "It will be noticed that for the first five years cars make good mileage, but during the next five years the mileage decreases, repairs increase, and the net profit is reduced to an average of 1.6 per cent. This suggests that for the first five years of a car's life it is a good investment, but after that it is not profitable to run them as an investment. For the first five years a car will net 9 per cent. on the investment, or about half pay for itself in mileage, but after that it is almost "nip and tuck" between mileage and repairs for the next five years. The life of a car depends altogether upon how long a road is willing to patch it up with repairs. I believe we have an occasional car now in service which was built twenty years ago, but I apprehend that very little of the original cars remain, and that it has been more expensive to keep them up than it would have been to destroy them and use the old iron in the construction of new cars. These figures prove, I think, that mileage at the rate of ¼ cent per mile is not excessive, and results only in a fair profit on the investment."

Poor's Manual for 1886.

The nineteenth volume of the Manual contains the usual statistical tables of the details of operation of the railroads of the United States, Canada and Mexico for 1885. The volume contains a few more pages than the last one, although the matter has been in some respects slightly abridged to make room for new matter which gives additional value to the work without making the book too unwieldly.

The reports of the different companies, instead of being grouped as formerly in the alphabetical order of States, are inserted promiscuously, and must be found by referring to the index. Some desirable additions have been made to the mass of statistics as heretofore given in the Introduction, and the great sectional divisions of States have been increased from five to eight, which is an improvement upon the former method. A table has also been added showing the dividends paid by each company from 1878 to 1885 inclusive, and also a very elaborate table covering 90 pages, showing the highest and lowest prices of the more active stocks and bonds in each month during the same period. There are also 50 pages of supplementary matter following the regular reports, containing statements and other information received too late for insertion in their regular order; also a list of city and suburban tramways, with details of operation, etc.

The tables comprising the general exhibit, covering seven pages of the introduction, are a compact and well-arranged mass of information exceedingly convenient for reference, and is presumedly as correct as it can be made in the absence of a uniform system of annual reports, and the diversity in the close of fiscal years. The compilers say in their introductory comments: "The past year undoubtedly marks a point of lower depression in the earnings of our railroads in ratio to their cost and mileage than is likely to be witnessed for some years to come, the present year showing a considerable improvement upon the past."

The following summary shows the comparative results of operation for 1884 and 1885, the quantity of rolling stock, and averages per mile of stock, bonds, cost, earnings, etc.:

	1885.	1884.
Total line mileage	128,966	125,579
Mileage constructed within the year	3,131	3,977
Total track mileage	160,597	156,496
Gross receipts from passengers	$200,883,911	$206,790,701
Gross receipts from freights	519,690,992	502,869,910
Gross receipts from other sources	44,735,616	61,024,357
Total gross receipts	765,310,519	770,684,908
Decrease in gross receipts	5,374,389	....
Net earnings	266,488,993	268,106,258
Decrease in net earnings	1,617,265	.. ..
Gross earnings per mile	6,295	6,693
Dividends paid	77,672,105	93,244,835
Passengers carried (not incl. N. Y. elev)	351,427,088	334,814,529
Passengers carried one mile (not incl. N. Y. elev)	9,133,673,956	8,778,581,061
Tons of freight transported	437,040,099	399,074,749
Tons of freight transported one mile	49,151,894,469	44,734,207,677
Steel rails in track (miles)	98,102	90,242
Iron rails in track (miles)	61,905	66,358
Locomotives	25,937	24,587
Passenger cars	17,290	17,303
Baggage, mail and express cars	6,544	6,411
Freight cars	805,519	798,399

Comparative statement showing the averages per mile of stock, bonds, cost and earnings, percentage of expenses to earnings, earnings per passenger train-mile and per freight train-mile, per passenger-mile, and per tonnage-mile, etc., for 1884 and 1885:

	1885.	1884.
Capital stock per mile of completed road	$29,867	$30,064
Bonded debt per mile of completed road	29,453	29,317
Cost of road and equipment per mile of completed road	55,059	55,329
Passenger earnings per mile of road in operation	1,612	1,801
Freight earnings per mile of road in operation	4,219	4,382
Gross earnings per mile of road in operation	6,255	6,663
Net traffic earnings per mile of road in operation	2,185	2,318
Percentage of expenses to earnings	65.12	65.21
Passenger earnings per passenger train-mile	0.949	1.001
Freight earnings per freight train-mile	1.518	1.502
Gross earnings per revenue train-mile	1,366	1,410
Gross expenses per revenue train-mile	0,892	0,918
Net earnings per revenue train-mile	0,474	0,402
	p. c.	p. c.
Passenger earnings—proportion of gross	26.9	27.1
Freight earnings—proportion of gross	67.4	65.9
Other earnings—proportion of gross	5.7	07.0
	cts.	cts.
Earnings per passenger per mile	2.198	2.365
Earnings per ton per mile	1.057	1.124
	miles.	miles.
Average distance per passenger	25.99	26.24
Average haul per ton	112.46	112.07
	p. c.	p. c.
Interest per cent. of bonds	4.77	4.66
Interest per cent. of bonds and debt	4.62	4.51
Dividends per cent. of stock	2.02	2.48
Interest and dividends per cent. of stock, bonds and debt	3.36	3.52

New Passenger Cars.

The Boston *Herald* of Aug. 11 thus describes a new train just put on the Old Colony Railroad: "The train, as run yesterday, and as it is to be run regularly, consists of five passenger coaches, a parlor car and a baggage car, each of them being of the Old Colony standard length, 60 ft., and together they constitute one of the handsomest trains run out of Boston. The baggage car, No. 2, was built in the Old Colony shops in South Boston, and is similar to others already on the road. The passenger coaches are painted outside the standard dark Pullman color, and ornamented with gold lines and modest designs. They are numbered respectively 262, 263, 264, 265 and 266, and are all alike outside. They are mounted on Pullman standard trucks, with Old Colony standard fittings, in order to keep all wearing parts of all the cars on the road uniform. They have 42-in. Paige steel-tired wheels, and are furnished with French's springs. The cars are wider than ordinary, so that ample room is provided for two persons on a seat, and accommodations are furnished for 76 passengers. The inside finish is solid mahogany, with head linings of oak, the mahogany showing carved lines and neat designs, while the oak is decorated in an artistic manner. There are 20 windows on each side, 26 in. wide, arranged in pairs, and furnished with blinds. The seats have mahogony frames, the backs being provided with locks which prevent passengers unaccustomed to upholstered furniture from throwing them over in order to put their muddy feet upon the cushions. The seats are unusually broad, are provided with the Hale & Kilburn springs, and, with the backs, are upholstered in crimson plush. There are five double centre Adams & Westlake lamps, which have been adopted as a standard by the Old Colony, and the sides of the car have handsome bronze baskets of unique design. At one end of each car is a small retiring room, and at the opposite end is an apartment, zinc lined, in which the Baker

heater is to be placed. One of the five cars has been fitted up as a smoker, the seats being upholstered in brown leather, and a number of tables being provided for card-players. A convenient lavatory is also provided in the smoker.

"The parlor car, 'King Philip,' No. 267, from the shops of the Wason Manufacturing Co., of Springfield, is to form part of the train. It is mounted upon M. C. B. standard trucks, is painted a handsome carmine, ornamented with gold. It is the same length as the passenger coaches, and is finished inside with solid mahogony, the head linings being of maple veneer, laid off in panels by strips of mahogany. The main saloon contains 22 chairs upholstered in crimson plush, while the smoking apartment has six chairs. Between the main saloon and the smoking compartment is a saloon and lavatory for gentlemen, and at the other end is a retiring room and lavatory for ladies and a closet for the Johnson heater. The windows are furnished with curtains, the floor is handsomely carpeted, and heavy French plate mirrors are placed at each end of the main saloon.

"The entire train is equipped with the Judkins train signal, the electric substitute for the bell cord, which is working so successfully on the Boston & Maine, Boston & Lowell and Boston & Providence (shore line) roads. Each car has six push buttons, four being inside and two outside. By means of these buttons the conductor is enabled to instantly communicate with the engineer, a gong being located in the cab and a code of signals for starting, stopping, etc., being provided. The train with its engine represents an invested capital of $52,000, and is to run in connection with the Fall River Line of Sound steamers.

The Bentley-Knight Electric Motor.

Our last issue contained come comments on the report made by a committee of the American Street Railway Association on the subject of electricity as a motive power, in which reference was made to a letter from a representative of the Bentley-Knight Electric Railway Co., setting forth the advantages of this company's system, together with certain claims and guarantees as to its utility as a street car motor. This letter was written by Mr. Robert W. Blackwell, Secretary of the Bentley-Knight Co., and was appended to the report of the committee. In the discussion which followed, the system was said to be unsatisfactory after a trial of fifteen months on the East Cleveland street line, at Cleveland, Ohio. We merely stated what appeared in the official report of the proceedings, and we now give Mr. Blackwell's view of the matter as contained in a letter received from him. After referring to our comments, he says :

The Bentley-Knight Electric Railway Co. is only too desirous of being "taken up" in its offer to equip fully any first-class street railway, under contract specifying that no payment shall be made until every requirement therein is specifically fulfilled; that it will furnish on demand "detailed and reliable estimates," and that it requested the committee to allow such formal estimates to be laid before the Association for consideration, with the sole result of having its letter to the committee published in the report, unbacked by any business-like statements whatsoever.

Of the gentlemen who criticised our system and stated our inability to perform the required work when offered, we can only say that one of them deliberately broke a formal contract with us from wholly personal reasons; another offered us the right to use a part of his line, wholly for our own amusement, on condition that we laid the line at our own expense, under bonds, and removed it entirely thirty days after its completion; while a third commentator, who stated that we refused an offer made us by him, omitted to state that the section of line he offered comprised the most phenomenal grades in the hilliest city of all New England, and that his company refused to make any stipulation whatsoever as to payment upon completion of the work, even when we offered to build the whole road and run it for three months subject to the company's full and entire approval.

Electricity *is* ready to do the work and it can to-day demonstrate its superiority over any other known power for the service in question. When the street railway men of the country give it a fair chance, treat the offers made as business propositions, and do not condemn it unseen, simply on the ground of novelty, electric tramways will become an established fact—certainly not before. The rustic in *Punch*, whose first idea on meeting a stranger was to fling half a brick at him, fairly exemplified in his demeanor the amount of courteous consideration extended, even in this progressive age, to a new idea.

A Mountain Railroad Accident.

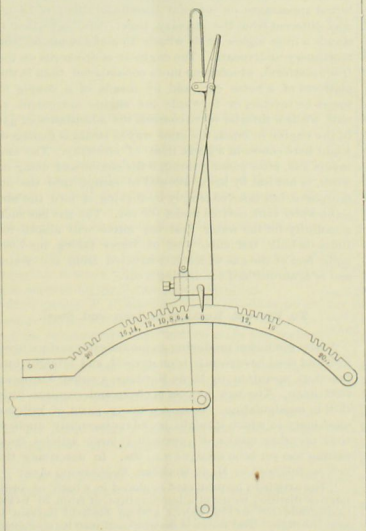
The railroad where the locomotive climbs the steep sides of Mount Washington by means of an iron ladder has made the American world familiar with that break-neck looking, but really not very dangerous, method of operating steep inclines. The success of that railroad led to the introduction of the system into Switzerland, and the famous Rigi mountain is ascended by an iron ladder railway with a grade of 1,320 feet to the mile, or one foot of rise to four feet of travel. A runaway on such a grade is like a jump over a precipice. Very effectual precautions are taken to guard against trains running away, but in spite of all human care accidents sometimes happen. A runaway happened on the Rigi railway last winter, the train consisting of one locomotive, two loaded freight cars, and a small passenger car, all coupled together in order that the cars might pass more easily over the less severe grades, which were covered by thick layers of snow. This coupling together of cars and engine is strictly prohibited on the Rigi railroad, and was not justified in the present case, but this rule is often violated. The train in question was a work train in charge of the roadmaster. The freight cars were loaded with lumber in such a manner that the brake wheels could not be reached. A fireman stood at the brake of the passenger car, but jumped off before putting on the brake. When the train reached the lower end of the Kraebelwand, where no snow was lying, and which is 1¼ miles from the lower station, the men heard a heavy crack, followed immediately by a great increase of the speed of the train. The laborers on the platform of the car jumped off shortly after they had heard this noise, and further on the roadmaster did the same. The train ran away, passed with lightning speed and deafening noise a distance of about 2100 ft., including several curves, and left the track a short distance below the watering station Kraebel, going over a precipice to a meadow below. The locomotive turned three time, once lengthwise and twice crosswise, and stood then again upright on the wheels. The freight cars probably followed the engine and were thrown around its circle of 1 000 ft. The broken coupling was found between the engine and the first freight car. The coupling of the passenger car was also torn off, and the car probably left the track with one wheel soon after the accident. It was thrown entirely off the track further down and stood on its wheels in front of the freight cars. The roof and sides of the cars were scattered around. The boiler and the cylinders of the engine remained intact, the rest of the engine being almost entirely destroyed. The track was not damaged to any extent. This proves again how strongly the rack rails are constructed. The immediate cause of the accident was the breaking of the working shaft, which had an old crevice 7 in. long and about 0.1 in. deep. A similar break of the engine shaft occurred at the same place several years ago, but the brakes were applied at once and the train was stopped.

Reverse Lever for Locomotives.

We are indebted to the *American Machinist* for the accompanying cut of a new design of a reverse lever and quadrant for locomotives, and we copy from that paper the following description of same by the designer :

Editor American Machinist :

In your issue of July 10 I see that Angus Sinclair, at the Master Mechanics' Convention, puts forth a pertinent and timely argument for a reverse lever and quadrant that would permit finer graduations of cut-off. I send you a sketch of a lever and quadrant I designed (no patent) which



was put into satisfactory use. The sketch is self-explanatory. You will notice that the dog is on the front side. When on the back side the weight of links draws so hard on gib-set screw that the point soon sinks into gib, resulting in lost motion. When put at the front the whole surface is opposed to the weight of links. The thumb piece can be located on either side.

The quadrant can be cut to suit individual taste. Many builders do not give the dog and notches draft. This, I think, is wrong, because when the dog bottoms in the notches there is soon lost motion, and resulting "chucking" at every stroke of the engine. When straight notches are used the dog also lifts out hard; with bevel notches it lifts easily.

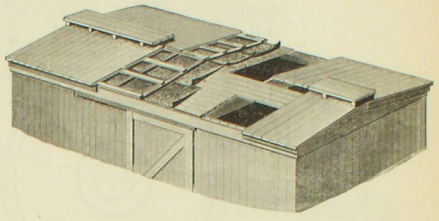
A tell-tale indicates the point of cut-off, graded as fine as desired according to construction. At the same time, with notches and teeth accurately formed, ample wearing surface is provided.

A word about the figures on the quadrant : I never saw any that were half large enough. They ought to be so large that an engineer can *feel* them at night.

TROY, N. Y. WM. H. BRADT.

Winslow's Patent Asphalt Car Roofing.

The cut shows the application of this roofing to freight cars. When applying it to new cars, the inside roof should be put on lengthwise, as it adds very much to the strength of the roof. In re-roofing old cars with double board roofs, the asphalt may b applied over both courses, or the upper course may be removed (we would recommend removing the upper course), and bottom course made smooth by removing all loose nails and countersinking all others. It is not necessary that the lower course of boards should be matched. For re-roofing old tin roofs, remove the old tin, make the boards smooth. Where the tin roof is



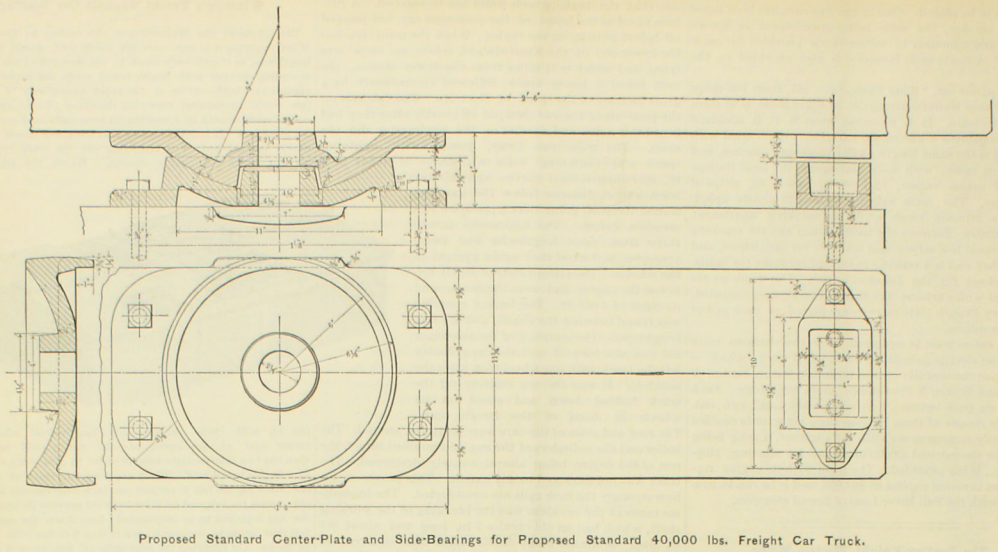
put on with circle car-lines, the longitudinal ribs at the center and at the eaves of the car should be thicker than the two intermediate ribs, in order to give it the same pitch as a double board roof. When applying felt, start at one end of car, allowing the felt to project one inch over the end and side of car; unroll the felt and *let it lie loose* (to prevent its tearing when the car is jacked up or overloaded); turn down the one inch of felt that projects, tacking it once in 6 or 8 inches with 10 or 12 oz. tacks. On applying the next strip of felt, allow it to overlap the strip first laid five or six inches. Paint between laps with *hot* asphalt. Stick the laps together. In laying over ridge, paint laps in same manner. Use great care not to get any asphalt under the felt to stick it to the roof boards. Care should be used not to tear the felt in any way by stepping on it. Three or four smooth boards laid upon it temporarily, to walk on, will prevent tearing. The better way is to have a scaffold around the car, which is customary in all shops, so one man can work from the scaffold. After felt is all on, put on the sub-rafters, painting under them with hot asphalt; tack them at each end to hold them in place until screws or barbed wire nails are put in longitudinal ribs; then put on a good coat of *hot* liquid asphalt over the felt. Next put on longitudinal ribs, fastening them in place with 5or 5½ inch screws, or barbed nails driven through sub-rafters into roof boards and main car-line. The sub-rafters are placed over each main car-line and one between car-line, making distance between about 20 to 24 inches. Screws or barbed nails should go into car-line far enough to hold roof securely. Nail on distance pieces at the ends of each sub-rafter ; these distant pieces are ⅝ thick and of same width as sub-rafters. Take off corners of sub-rafters so there will be no sharp corners next to felt. Nail on fascia, and finally out. side roof boards. Any good, common lumber free from loose knots will do for roofs. The important thing is to get the roof on complete without tearing any holes in the felt ; when this is done, the roof will last the life of any car without repairs or attention.

This style of roofing is in use on the cars of a large number of roads. Testimonials and other information furnished on application to the proprietors, Drake & Wiers, Cleveland, Ohio.

California Redwood.

The friends of redwood have spread broadcast any amount of insufferable gush about redwood lumber. It has been called a furniture wood, a fancy wood ; but it is neither. It has enough merits to recommend it without attributing to it any imaginary qualities. It is simply a good building wood with points in its favor over white pine even. Once thoroughly seasoned, it will neither shrink nor swell—the only wood, so far as we are aware, that has that characteristic. Recently, a test was made in Kansas City in order to prove, or disprove, this claim for it. A piece of a strip, an inch thick and four inches wide, was placed in water four days, and at the end of that time it could not be discovered that it had perceptibly swollen. On this account redwood is admirable for window sash and frames, for when once well fitted there is no "sticking" forever after. For shingling surfaces which are exposed to view on structures of the Queen Anne architecture style there is nothing that will answer so well as redwood shingles, for the reason that the joints remain as perfect as when made until the shingles are worn out by the elements. For ordinary doors redwood is not in favor with many, the charge against it being that in case a door slams hard it is liable to split. The slowness of redwood to burn is also another thing in its favor.—*Northwestern Lumberman.*

AN iron bridge on the Pennsylvania Railroad, weighing 190 tons, was recently moved bodily 32 feet in 48 minutes by half a dozen men under the supervision of Master Carpenter Webb, of the Pittsburgh Division, with the object of placing it on a stone arch. This is the third operation of the kind since May. There was no impediment to the passage of trains, the rails being elevated accordingly as the bridge was lifted and ballasted by the trackmen. Three 60-ton jacks were placed under each end. All the iron bridges on this division, after being in use 25 years, are to give place to stone. Heavy locomotives are to be put o the road.



Proposed Standard Center-Plate and Side-Bearings for Proposed Standard 40,000 lbs. Freight Car Truck.

Recommended by Committee of Master Car-Builders' Association.

Improved Crampton Locomotive.

We have several times lately mentioned the Crampton locomotive, which is used very successfully as a high-speed engine on several continental railways. The engine has met with particular favor in France, and supplied the pattern for all the locomotives on several of the most important railways. The machinery of this type of engine is all external, and has many of the conveniences and advantages peculiar to the American locomotive. The leading original aim of the inventor, Mr. Crampton, was to keep the center of gravity as low as possible, and to get the boiler near the road-bed, he employed a single pair of driving wheels which were placed behind the fire-box. The cylinders, eccentrics, link motion, axle-boxes and guides were all outside of the driving wheels, so that they were constantly under the eye and visible supervision of the engine-runner. The engines displayed wonderful durability, and the cost of maintenance was extremely low compared with other European locomotives.

The increasing weight and accelerated speed of trains lately demanded, have made locomotives with a single pair of driving wheels inconvenient, and Mr. Crampton has designed an improved form of his engine to meet the new requirements of train service. The engine was described in a paper recently read at a meeting of the Société des Ingénieurs Civils, at Paris. From that we learn that the new locomotive is the original Crampton engine doubled. Two pairs of driving wheels, 82 inches diameter, are used, and they are placed, one pair at each end of the boiler. The boiler is a novelty for locomotive service, being the marine pattern composed of two portions, the lower one inclosing a tubular fire-box, consisting of a Fox corrugated flue, which extends the whole length of the boiler, and is surrounded by water. The upper portion of the boiler contains the tubes and provides steam room.

To drive the two pairs of driving wheels, four small cylinders are employed, the two on the right, placed one behind the other, drive the front wheels, to which the connection is made on two crank-pins set at an angle of 180 degrees, and as close as convenient together. It is claimed as an advantage of this arrangement that the power of the steam, although transmitted through two pistons and two rods attached to two crank-pins, only produces the effect of a simple torsion almost free from action on the axle-box jaws. The hind driving wheels are driven in the same manner by the cylinders on the other side of the engine. As in the old Crampton type, all the machinery of this engine is located outside the wheels. It is claimed that this type of engine gives peculiar facilities for compounding.

Ammonia Gas as a Street-Car Motor.

The New Orleans *Picayune* reports an interesting trial of a new motor on the Carrolton & Canal Street Railway of that city, the propelling agent being ammonia gas, the application of which is described as follows:

"This gas, which is little more than one-half the weight of air, is powerfully expansive, and when passed through the cylinders of a steam-engine, will operate just the same as steam in moving machinery. In order to utilize the gas, it is stored in a strong iron reservoir, which is carried under the floor of a car, and is supplied to the engine just as steam is used from a boiler. In order to be able to carry enough of the gas to drive the machinery for any considerable time, the gas is forced by powerful pumps into the reservoir on the car until a pressure of from 180 to 200 lbs. to the square inch is reached, its force being indicated by a gauge much the same as a steam-gauge. Each car is supposed to carry enough gas to make a trip back and forth between Carrolton and Canal streets. The engine is not a separate matter from the car, as is the steam dummy; but each car is its own engine. There being no fire, no smoke, no steam, no heat, there is no need to have the propelling power separate from the cars that carry the passengers, but on the contrary, the propelling appliances are compactly stored beneath the floor of the car, which, in external appearance or internal accommodation, is in no way different from the ordinary street cars, save that it stands a little higher on its wheels, to make room for the machinery underneath. The engineer or driver sits on the front platform, which is no more encumbered than is the platform of a horse car, and by means of a couple of levers he reverses or forwards the engine movement a will, while a throttle valve controls the admittance of gas to the engine in much the same way as steam is managed. Right here comes in a great item of economy. The ammonia gas, after passing through the engine and doing its work, is not lost by being allowed to escape into the atmosphere, but is saved simply by turning it into the air-tight water tank carried under the car. The gas has such an affinity for the water that the latter will absorb 700 times its bulk, ten cubic feet of water taking up 7,000 cubic feet of the gas which is extracted from the water and is again utilized for driving a car."

To Prevent Rusting of Iron and Steel.

A new method of producing an inoxidizable surface upon iron and steel has recently been devised and brought into practical operation by M. de Meritens, a noted European electrician. The new process is cheap and requires little skill in manipulation. There are many parts of railroad machinery to which it might be advantageously applied, since no other means of preventing large articles from rusting has yet been brought into use. In describing the process followed by M. de Meritens, *Engineering* says:

"The article to be protected is placed in a bath of ordinary or distilled water at a temperature of from 70° to 80° Centigrade (158° to 176° Fahr.), and an electric current is sent through. The water is decomposed into its elements, oxygen and hydrogen, and the oxygen is deposited on the metal, while the hydrogen appears at the other pole, which may either be the tank in which the operation is conducted or a plate of carbon or metal. The current has only sufficient electromotive force to overcome the resistance of the circuit and to decompose the water, for if it be stronger than this, the oxygen combines with the iron to produce a pulverulent oxide which has no adherence. If the conditions are as they should be, it is only a few minutes after the oxygen appears at the metal before the darkening of the surface shows that the gas has united with the iron to form the magnetic oxide $Fe^3 O^4$, which it is well known will resist the action of the air and protect the metal beneath it. After the action has continued an hour or two, the coating is sufficiently solid to resist the scratch brush, and it will then take a brilliant polish. The depth of penetration is shown by the following fact. A gun barrel was oxidized, and then the magnetic coating was completely removed by emery until the surface again became white. It was again returned to the bath, and immediately, on the passage of the current, the black color again reappeared. If a piece of thickly rusted iron be placed in the bath, its sesquioxide ($Fe^2 O^3$) is rapidly transformed into the magnetic oxide. This outer layer has no adhesion, but beneath it there will be found a coating which is actually a part of the metal itself.

"In the early experiments with the process, M. de Meritens employed pieces of steel only. But when he turned to objects in wrought and cast iron, he found he no longer was successful, for the coating was not fast, and came off with the slightest friction. After many trials with currents of different electromotive force, he reversed the order of affairs, and placed the iron at the negative pole of the apparatus, after it had been already applied to the positive pole. Here the oxide was reduced, and hydrogen was accumulated in the pores of the metal. The specimens were then returned to the anode, when it was found that the oxide appeared quite readily and was very solid. But the result was not quite perfect, and it was not until the bath was filled with distilled water, in place of that from the public supply, that a perfectly satisfactory result was attained.

"The process, it will be seen, is perfectly simple, and demands but little skill in its execution. Now that dynamo machines have superseded batteries as sources of electricity, all that is required is a tank, a quantity of distilled water, and a little power to drive the machine. By placing a number of baths in series, and increasing or diminishing their number, the electromotive force of the current can be regulated without any arrangements of artificial resistances. We expect that many manufacturers will give this process a trial."

Railway Men's Christian Associations.

Several of the large American railway companies are acting very liberally toward the Railway Men's Christian Associations. The companies in New York State pay $13,000, and to this sum the employés and their friends add $10,000. In Chicago, $7,000 a year is furnished in cash by the companies, besides very much in kind, and the demand is for more work of the kind. The Chicago, Milwaukee & St. Paul Railway gives $1,200 a year at Milwaukee, and the Chicago & Northwestern and Wisconsin Central give $600 each per year at the same place. The Minneapolis road gives $3,300, and those centering at Atlanta, Ga., $1,500. Some large-minded railway men say that the money thus spent yields absolutely the best results of any money spent by the companies for any purpose whatever. Hon. Chauncey M. Depew, President of the New York Central, says of the Association:

"I have had the opportunity to become personally familiar with the workings of the railroad branch of this Association. The results can hardly be overstated. On the lines with which I am connected 100,000 men are employed, and they represent over half a million people in their families. The effect of the establishment of one of these societies at a railroad centre is marked and immediate. The character of the service begins to improve. Salaries and wages, which have been worse than wasted, are spent upon wives and children, and the surplus finds its way into the savings bank and from there into the homestead."

THE Canadian Pacific road has fitted up a number of cars with baths. We suppose they are mere ordinary bathing tubs and not swimming baths, and that the water is supplied warm from the tender tank. If they prove a success on the Pacific routes, there will be a clamor for them on all railroad trains. The next demand will probably be for a lawn tennis compartment on limited express trains.

M. N. FORNEY'S IMPROVED CAR SEAT.

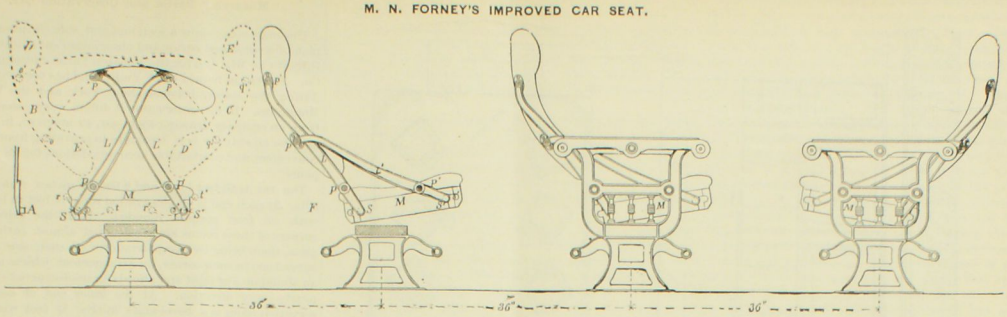


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

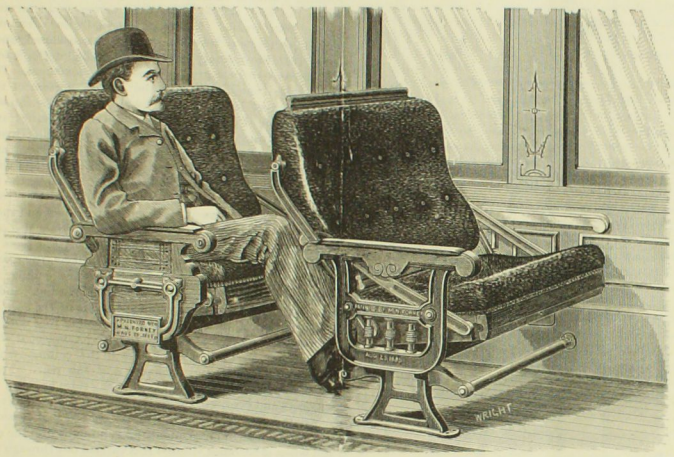


Fig. 5.

The object of the inventor in designing the seat shown in the cuts was to remedy some of the defects of ordinary car seats by providing a more complete and perfect bearing surface, by means of which every part of the body in contact with the seat will receive its natural support. This is accomplished by giving to the seat-cushion, from back to edge, an ample width, and a concave instead of the usual convex form; and also by adapting the seat-back to the curve of the spinal column in such a way as to give effective support to the head and neck, shoulders, and "small of the back." The mechanism for reversing the seat-back, the form of which made the use of the ordinary seat-arms and pivots inadmissible, is shown in the cuts.

The cross links or arms, *L L'*, Fig. 1, are connected to the seat-end by fixed pivots at *P P'*, and to the seat-back by other pivots *p p'*. The links project below the fixed pivots *P P'*, and each of them has a projecting pin or stud *S S'* (shown in a front view of one of the links at *A*, Fig. 1), which supports the seat. The seat or cushion-frame has slots *s s'* in each end which receive the pins *S S'*. These slots allow for the variation in the distance apart of the pins, which occurs when the back is reversed. The action of these links will be readily understood if we follow the movement of the back from the position shown by dotted lines at *B*, Fig. 1, which is the same as that in which it is represented in Figs. 2 and 3, to the position when it is turned half-way over, represented in full lines in Fig. 1, and finally to that indicated by dotted lines at *C'*, when the back is completely reversed. The dotted lines *o p q* and *o' p' q'* represent the paths in which the upper pivots move when the back is reserved, and *r s t*, *r' s' t'* are the paths which the lower pins or studs describe during the same period. The seat *M* in Fig. 1 is represented in one position only—that which it occupies when the back is half-way turned over; but in Figs. 2 and 4 it is represented in its reversed position.

These illustrations show that the reversal of a seat-back, of the form and proportion described, is effected in a very perfect manner by means of the crossed links, and by connecting them to the seat, as described, the latter is moved horizontally and its inclination is changed simultaneously with the reversal of the back. If the seat is not moved horizontally when the back is reversed, more room lengthwise of the car will be required for each seat of a given width, and a back of any desired form or inclination. With this mechanism for reversing the backs they can be made of any required height, and, as appears from the illustrations, their lower edges come above the tops of the seats. Therefore, although they are of ample height, their width need not be any greater than that of those ordinarily used. It will be seen, too, that the space at *F*, Fig. 2, behind the seat is entirely clear, so that with seats of this kind there is more room than with those ordinarily used. This is shown clearly in the perspective view, Fig. 5. The difference in this respect is very marked, if the comparison is made with seats which have wide backs like those adopted on the Pennsylvania Railroad.

The fixed pivots *P P'* attached to the seat-ends are as low down as the top of the seat. Consequently the seat-arm and the window-sills need not be made any higher than is consistent with comfort. Usually they are so much above the seat that when the arms of passengers rest on them their shoulders are raised up into an uneasy position. If such window-sills and seat-arms were lowered from 2 to 6 in., they would be much more restful to occupants of the seats. This is one reason why some prefer the drawing-room car chairs to the common reversible seats.

Fig. 5 is a perspective view of two seats, one with an iron and the other with a wooden end. These show the form of the seats and backs, and also the space which they give to a passenger. Seats of this kind are in use on the New York & New England, the Long Island and the New York Central & Hudson River railroads. The plan has been patented by the inventor, who will be happy to answer any inquiries addressed to him at No. 71 Broadway, New York.

Woods and their Destructive Fungi.

This is the title of an exceedingly valuable paper by P. H. Dudley, C. E., continued from the August to the September number of *The Popular Science Monthly*, in which the subject of the decay of woods is treated from the standpoints of experiment and observation. The information furnished by the writer is of the greatest importance to railroad, lumber and building interests, and possesses an economic value that can hardly be overestimated. He refers at the outset to the extensive collection of native woods recently contributed by Mr. Morris K. Jessup to the American Museum of Natural History, in New York, and then sets forth with the great fullness of detail the true causes of the decay of wood, which he attributes to the attacks of fungi, the various species of which are illustrated by engravings. The conditions most favorable to their growth are pointed out, their destructive effects upon different kinds of timber, and the precautions best adapted to prevent decay. The article also contains many valuable suggestions in respect to railroad ties and the material used in the construction of cars, and also for telegraph poles, submerged piles, posts, roofing, etc. The proper time for cutting timber is indicated, the effect of leaving the bark on, the nature of "dry rot," and other things pertaining to the economic use of wood which are but imperfectly understood by builders and lumber dealers. The various preservative processes are noticed and their advantages set forth, especially in the treatment of cross ties. In respect to the practice, which so extensively prevails, of using unseasoned lumber for freight cars and other kinds of construction, the writer says :

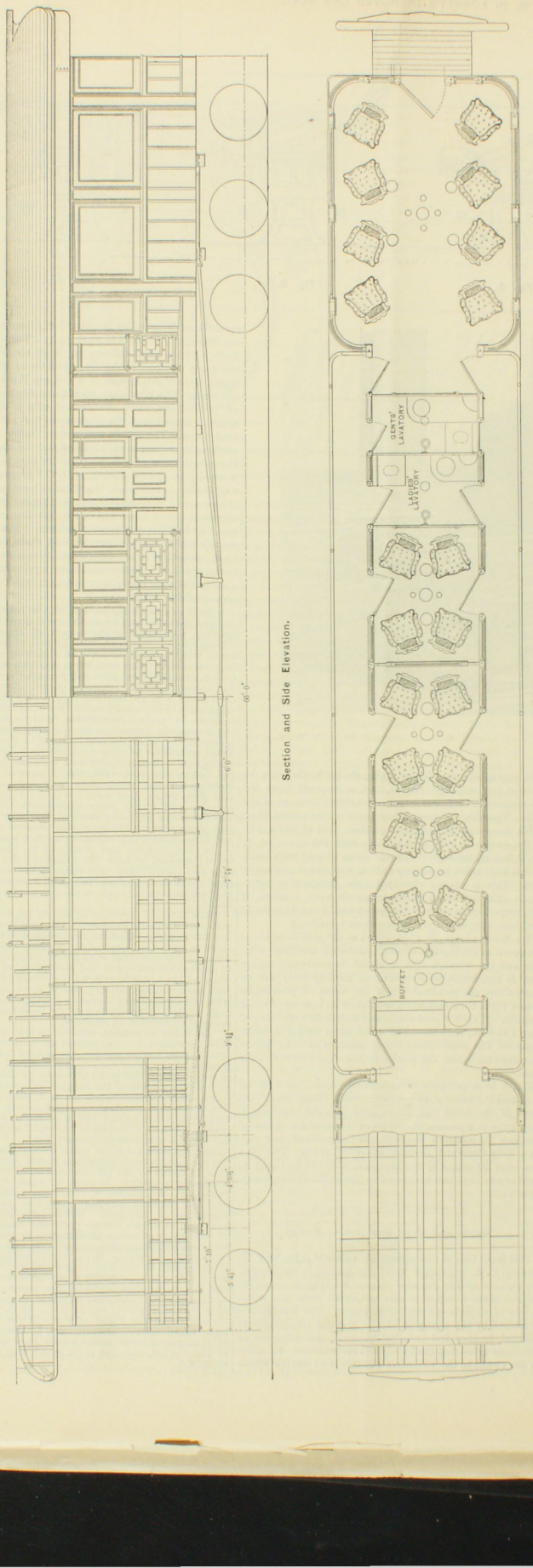
"Dead trees with the bark on will be found more or less covered with fruiting fungi, the wood decaying with great rapidity, while those with the bark off remain sound for a longer time. The bark, like the coat of paint on unseasoned wood, retains the moisture, teaching that wood will be protected by paint only when it is thoroughly seasoned or dry, otherwise the paint will furnish the artificial bark and hasten instead of retarding decay. Readers who are conversant with the decay of freight cars will understand what must be expected from the use of so much unseasoned lumber in their construction, and will comprehend the conditions furnished for the growth of fungi by the moisture inside of the cars retained by the outside paint. These facts must be more generally understood before the car-builder will be supplied with seasoned lumber. There lies before me as I write this a piece of timber from a building erected about eight years ago. To prevent the sills from decay, they were covered on three sides with asphalt, and tarred paper underneath the preparation. The wood was so badly decayed that they were replaced two years since. The wood was cracked longitudinally and transversely, the cracks being filled with the mycelia of the fungi which had destroyed it; upon drying, the wood crumbled to dust—the so-called "dry rot." Planks only two inches thick and eight inches wide were tarred on three sides at the same time, and were rotted under the tar over an inch in depth, while the unprotected side was sound.

"The cheapest operation to protect our woods, and quite sufficient for many purposes, is to season or thoroughly dry the timber, reducing the contained moisture from eight to twelve per cent. of the weight of the wood; and when in this condition, with a circulation of air around it, to prevent the collection and absorption of moisture, the wood will last indefinitely, as the fungi cannot grow in such surroundings. Every one is more or less familiar with the soundness of timber in the upper parts of buildings, while in lower parts near the foundations it is often decayed on account of moisture.

"In many situations, however, where timber must be used, the conditions of growth of the fungi are present, and it will decay; some species can be used which resist the attacks of the fungi for a long period, but the final result is decay unless the wood is treated by some process preventing the growth of the fungi, which must be capable of doing either one of two things : 1. It must keep the fibers dry, preventing the absorption of moisture. 2. If the wood must be in a damp place and kept moist, some antiseptic must be present, sufficient to prevent the growth of any of the various kinds of destructive fungi. Timber entirely submerged does not come under these considerations. To use the first process successfully means more than a thin coat of paint or tar on seasoned wood when exposed to continued moisture. It must be some substance which penetrates the tissues of the wood sufficiently far, in case the exterior surface is broken, to prevent any absorption of moisture. Woods impregnated with the heavy tar or lighter oils are protected more from the fact of prevention of access of dampness to the fibers than by the contained antiseptics, unless in the exception of a great percentage of creosote. In the second method the moisture is permitted to come in contact with the fibers of the wood, and reliance depends upon the antiseptic. In this case the entire wood should be saturated to give the greatest measure of success, not merely an exterior protection of a half-inch or so in depth, the latter fact, as before explained, being the cause of many of the failures which have taken place. The antiseptic treatment, to succeed, must destroy all the germs which have found lodgment in the timber, and also those which may come from the exterior."

COMBINED PARLOR AND OBSERVATION CAR.

Built by the Gilbert Car Manufacturing Co. for the Monarch Parlor-Sleeping Car Co



"Monarch" Parlor and Observation Car.

The engravings show a sectional and side elevation and plan of a combined parlor and observation car built by the Gilbert Car Mfg. Co. for the Monarch Parlor-Sleeping Car Co. The car is named the "Ymir," and has been running during the season between New York and the White Mountains. In its construction it differs very essentially from an ordinary drawing-room car, so much so, in fact, as to be an entirely new departure in providing luxurious, convenient and comfortable accommodations for its occupants.

The car is 66 feet long, and 9 feet 10 inches wide over sills. At each end is an observation room 16 feet in length, with its four corners rounded. Both the sides and corners of these rooms are constructed almost entirely of glass, there being two large windows on each side and a curved one in each corner, an arrangement which admits an abundance of light and affords an unobstructed view in nearly every direction. At the inner end of each observation room is a bevel-plate mirror 5½ feet wide and reaching from floor to ceiling, upon each side of which are doors opening into aisles 26 inches wide, extending from one observation room to the other on each side, and forming a kind of balcony which is protected by the roof; while the roof at the same time serves as an awning to the state rooms. This plan, especially for a car designed for pleasure travel in summer, is considered much better than the ordinary central aisle, as the interior is less cut up and there is greater freedom of movement. The three state rooms occupying the central portion of the car, are 7 feet long by 5½ feet wide, and can be thrown into one room if desired. The positions of the buffet and lavatories are shown in the plan. The total seating capacity consists of 28 arm-chairs, movable on casters and upholstered in alligator leather. The floors are laid with tiles, and to further suggest the idea of coolness, the inside decoration is in blue and gold, and silver, with frostwork and icicle representations on the windows, and snow and ice on the outside. This idea of frigidity is also carried out in the glassware decoration. Along the sides of the interior are heavy silver racks and baskets, the spaces above and below the windows, and also the ceiling, are lined with highly decorated "Linerusta Walton," and a heavy silver foot-rail runs round the inside of the car.

Ventilation is provided for by a double roof with an intermediate air space from end to end. Connected with this air duct are suction ventilators in the ceiling, which exhaust the foul air and discharge it at the rear. Fresh air is supplied by pipes placed in the sides between the windows and connected with the hood on top, and having ventilator openings which can be opened and closed at will. Fresh air in large quantities is brought into the car, and when it becomes vitiated it is carried out through the ventilators in the top, while, by a peculiar construction of the tubes, the cinders and dust are discharged underneath the car.

The car is mounted on six-wheel trucks, with steel-tired paper wheels and French's spiral and elliptic springs.

The American Brake.

Superintendent Poor, of the American Brake Company of this city, has returned from the Burlington tests, and is making a series of important trials which could not be made in Burlington, by reason of the programme laid out by the Master Car-Builders' Committee. We shall make public the results of these trials when completed. This brake developed more power than had been expected by Superintendent Poor, when applied to 50-car trains, and this is one of the matters proposed to be remedied. The hasty manner in which the cars were constructed, after the Missouri Car and Foundry's fire, it is claimed, did not give the company time to observe the working of the brake upon such long trains or for preliminary trials which would have suggested changes that are now being made; the cars being taken direct from the works and put in the test, in order that the brake might be represented at the same time that the other brakes were being tested.—*St. Louis Railway Register.*

Master Car and Locomotive Painters' Association.

The seventeenth annual convention of this Association will be held in Chicago, beginning Wednesday, Sept. 8. A number of subjects relative to the painting of cars and locomotives will be reported upon by committees and discussed in their order. There will also be an extensive exhibition of color tests on panels prepared by members of the Association in October last, and exposed to the weather, the object being to determine the proper proportions of oil, japan and turpentine which should be used in mixing colors to produce the best results as to durability, etc. There will also be a number of panels finished on the natural woods by different methods, so as to ascertain which is the best adapted to the outside finish of cars where it is desirable to retain the natural color and grain of the wood.

THE Atlanta & West Point Railroad will have the longest sleeping car line in the world after the first of October. A family sleeper will then be put on this line, which will run from Atlanta to San Francisco, 3,000 miles, without change, by way of New Orleans and the Southern Pacific.

NATIONAL CAR LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock, construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

THE BURLINGTON BRAKE TESTS.

The elaborate series of tests at Burlington began July 13 and were continued until Aug. 2. The details of each day's operations embrace so many confusing conditions and complications that it is unnecessary to reproduce them in our columns. So far as a judgment can be formed from unofficial data, some highly important and well established facts have been ascertained in regard to the merits of the respective brake systems that were entered for competitive trial. As to the value and thoroughness of the tests and the fairness with which they were conducted, there seems to be no question. The trials were made under almost all the conditions of service that could be suggested as to length, weight and speed of trains, the time in the making of stops, the releasing of the brakes after stops, their effectiveness on different grades with all or a part of the cars equipped with brakes, the effect upon wheels, the power required, the smoothness or jerkiness of the stops under different conditions, etc. Although most of the competitors came to the ordeal with hastily prepared equipments, one of them so much so as to be compelled to withdraw from the contest at an early stage of the operations, yet enough has been done to show conclusively that the successful application of power brakes to freight trains so as to meet all the requirements of actual service is no longer a matter of uncertainty. As between the buffer and continuous systems, it is to some extent a question of comparative cost, assuming that the parties interested in the former can modify and improve it so as to remedy the defects that have been so clearly developed in the Burlington tests.

These tests have demonstrated beyond cavil the superiority of the air brakes in the essential qualities required for the handling of freight trains. In respect to the supply of power, the certainty, quickness and smoothness of stops, ready release and absence of breakage, the Westinghouse shows on the whole the best record. An ordeal so severe and trying and so remorselessly impartial, might be expected to reveal defects hitherto unsuspected in the most carefully devised brake mechanism, but the action of the Westinghouse seemed to be quite as good with 50-car trains, with brakes on every car and each car loaded with 40,000 pounds, as with trains of same length with 20 cars unbraked.

The Eames vacuum showed results inferior to those of the Westinghouse, which was to some extent at least owing to the bad condition of its equipment, the brake-shoes being imperfectly fitted to the wheels, and its managers having no previous experience with long trains. It was fairly successful, however, aside from a few breakages and a jerking application of the power, and even surpassed all competitors in the steadiness and evenness of the pressure of the brakes on the wheels. Both the Westinghouse and Eames systems showed a capacity for making smooth stops at all speeds and with all lengths of train up to 50 cars, loaded, empty or mixed. The question of choice as between the two may ultimately turn on the comparative cost; but the record of each in the recent trials place them in the lead, and demonstrate the advantages of having brakes on all the cars in a train.

The American (direct buffer) developed some unlooked-for defects, but much of its record was very creditable. It made the longest number of runs and the best showing of any of the buffers, and did well with trains of 25 cars, a part of them only being equipped with the brake, making some good stops with ready release. But in emergency tests with trains of 50 cars, and in going down grade at 15 miles an hour with the same number of cars, a part only equipped with the brake, there were frequent and severe shocks and undulations, in some cases breaking the drawbars. The brake worked well on short trains with the brakes appled to the forward cars. The American steam driver brake performed exceedingly well and made an excellent record.

The Widdifield & Button friction buffer car did fairly well with 25-car trains on level track, but with 50-car trains on a descending 55 feet grade its working was attended with a succession of severe shocks, and only less so with trains half the length on same grade. The management of this brake hope to overcome these defects by changes in its construction.

The Rote brake worked so badly in the preliminary trials that it was withdrawn from the list of competitors.

In behalf of the buffer brakes, it should be said that they entered the contest with hasty preparation and with imperfect knowledge of the work laid out for them, and of the capacity of their own devices. They had little or no experience in the handling of long trains, and the severity of the tests in this respect caused the performance to fall short of the requirements. A more careful preparation would doubtless have shown better results. As it was, the devices, instead of doing themselves justice, behaved at their worst in some of their trials instead of best. Some allowance should, therefore, be made for their shortcomings, although their manifest inferiority as compared with the the air-brakes must be admitted.

Some interesting experiments were made as to the comparative effect of loose and close couplings, the result of which was that by taking out about 3 inches of loose link slack between each car by inserting iron wedges, the violence of the shock from sudden application of the brakes was very much diminished. The starting capacity of engineswas also tested in the same way, but with no very decided results.

In regard to the service tests to be continued during the next eight or nine months as originally proposed, nothing definite has yet been decided upon. The Westinghouse and Eames brakes having passed all the general tests are entitled to enter the endurance tests, but the buffer equipments are certainly not now in a condition to do so. New appliances may in the meantime be forthcoming as competitors in the service tests, but whether they will be excluded is a matter for the committee to determine.

As will be seen by a notice in another column, a joint meeting of the committee and the brake companies participating in the tests, will be held in New York, Sept. 15, to reconsider the rules adopted at Harrisburg in reference to the endurance tests.

WEAR OF DRIVING-WHEEL TIRES.

Where the feed-water provided for the locomotive boilers on a railroad is fairly free from the impurities that deposit scale or mud, an engine can be run with trifling expense for repairs and cause no delay in having them done, till the tires need turning. To turn a set of tires is not necessarily a heavy or expensive operation, but it causes the engine to be taken into the shop for a few days, and if this happens when traffic is crowding the operating department, the loss of the engine is an inconvenience. A set of tires that will run twice as long between turning as another set thus becomes an important element in reducthe expense of repairs, and often keeps an engine in service when the extra work done is worth far more than the price of first-class tires. This being the case, master mechanics are naturally anxious to use tires that will make long mileage without turning, but there is great diversity of opinion as to what conditions will prolong the life of tires by reducing wear and tear. On no subject connected with locomotive engineering do we find railroad mechanical men more disposed to talk or to ask for suggestions. There is no disposition to abuse tire-makers for producing an inferior article, as there is with those who are intimately interested in the wear of steel rails and blame the makers for supplying steel mixed with cinder, but there are many complaints about the tires not wearing longer than they do. The circumstances connected with the wear of tires are often of a nature to puzzle the observer. A master mechanic who devoted careful attention to the tire question, mentioned a curious performance of a set of tires. The engine was on heavy passenger service and was run continually by one engineer. The tires were put on in the beginning of winter, and ran close on two years before they needed turning, having made about 18,000 miles to each $\frac{1}{8}$ inch of wear. At the end of another year the tires had to be turned with about 8,000 miles to the $\frac{1}{8}$ inch of wear. After that the engine made about 20,000 miles to the $\frac{1}{8}$ inch of wear for the remainder of the life of the tires. There was no extra work done during the period the tires wore fast, and the same man held the throttle. Of course this is a striking instance of the "uncertain in locomotive engineering," but there was a cause for the rapid wear if it only could have been discovered, and it would be a good work in the cause of knowledge if those who come in contact with "mysterious" cases of this kind would display energy and ingenuity in finding out their origin.

Complaints that we have heard made about the tires of certain locomotives wearing badly in comparison to others, are susceptible of easy explanation. Tires wear in two ways. The weight of the engine pressing upon the drivers leads to abrasion of the surface coming in contact with the rail, and as the wheel rolls round, the tire wears away by the minute bruised particles dropping off. That is the wear of rolling friction. The second method of wear is that of sliding friction, where the slipping of wheels on the rails grinds away the tires, as an emery wheel wears away the surface from any article put in contact with the revolving face. The sliding friction, where it comes much into action, is by far the most disastrous to the life of locomotive tires. Inordinate slipping of driving wheels results from two leading causes—very hard tires and too little weight on the drivers. The art of making steel tires is so highly perfected that tires too hard for economical service are rarely produced. Where an engine is noted for slipping badly, the cause is nearly always that the cylinders transmit too much power for the adhesive weight upon the drivers. The engineering world has never discovered or settled upon a limit of the weight that can safely be placed on driving-wheels, but a few years ago Mr. Chanute and a few other engineers insisted on limiting the weight on each wheel to 12,000 pounds. This teaching for a time exerted powerful influence on the designing of our locomotives, and its effect is still apparent on many roads. The weight was insufficient for engines with cylinders larger than 15 × 24 inches, with drivers five feet in diameter, but many large cylinder engines were built with the weight on the drivers little beyond the limit mentioned.

Slippery locomotives and the attempted remedy of a stream of sand constantly dropping on the rails, will always be found on a road or division where the tire mileage is low. While investigating this subject we obtained some carefully collected statistics relating to the wear of tires on different classes of locomotives. The information gave the capacity of the cylinders, the size of driving-wheels and the weight upon them, the kind of service the engine was employed upon, and the mileage made per 1-16 inch of tire wear. The figures indicated that the man at the throttle had a good deal to do with the conservation or destruction of tires, a matter which most master mechanics are perfectly competent to deal with, but on the whole the tire wear was in the inverse ratio to the weight on the driving-wheels. The case of two classes of eight-wheel freight engines running on one division and doing similar service may serve as a specimen of the whole. All the engines had driving-wheels 57 inches diameter. The first class had cylinders 17 × 24 inches and 28 tons on the driving-wheels. They ran an average 9,476 miles per 1-16 inch of tire wear. The second class of engines had cylinders 18 × 24 inches and the weight on the drivers was 26 tons. They made an average of 2,945 miles per 1-16 inch wear of tire.

Where a master mechanic is troubled with unequal wear of tires, he should classify his locomotives, showing the tractive power of cylinders and the weight on drivers. Where this is done valuable information will nearly always be obtained if the tire wear is carefully ascertained.

IMPROVING THE LOCOMOTIVE BOILER.

The boiler of the locomotive has excessively difficult duties to perform when it supplies without inordinate waste the ever-varying steam requirements of cylinders developing the power to run fast or heavy trains over an uneven country. A well-designed boiler—and most American locomotives have well-designed boilers—performs its functions as efficiently as any ordinary mechanical appliance, yet there is a wide-spread belief which is not confined to the outside of engineering circles, that the locomotive boiler is very defective indeed. As American inventive talent prides itself in rising to provide remedies for all mechanical imperfections, it is not surprising that the alleged defects of the locomotive boiler have received particular attention from that class of inventors who are prepared to design improvements for every appliance, no matter how little they may understand about its duties. The man who is prepared to save 25 per cent. of the coal used in the locomotive fire-box by the use of a patent grate bar may still be found with his model in his gripsack convenient for inspection. The enthusiast who has a smoke-consuming appliance that he alleges will save 50 per cent. of the coal, is not yet blotted out by the skepticism of master mechanics, and those who are to save all the remainder of the fuel used, by means of patent ash-pans, spark arresters, feed-water heaters and other inventions are still round vigorously attending to business, as most railroad officers are ready and willing to testify.

We are far from wishing to depreciate efforts to reduce the quantity of coal used to generate steam in locomotive boilers, but at the same time we would like to point out that the possible saving is much more limited on well-managed roads than many people believe it to be. A well-designed stationary or marine boiler with natural draft and well fired will utilize about 80 per cent. of the heat in the coal for steam-making, and about 20 per cent. will be lost by the hot gases passing through the chimney. It will never be possible to do much better than this, for the heat in the waste gases must necessarily be higher than

the temperature of the boiler. These results are obtained under conditions that never can be equaled with a locomotive when a small boiler must be forced to evaporate a large quantity of water to the foot of heating surface. There are locomotives running on many railways, pulling heavy or fast trains, that utilize about 60 per cent. of the heat developed by the coal. Engines of this degree of efficiency are rather exceptions, as the accounting of 50 per cent. of the heat is about the ordinary average; but the locomotives making the best use of their coal have no features about them that all engines on American railroads might not easily possess. Plenty of grate area and liberal heating surface in proportion to the cylinder capacity is the first requisite, which is supplemented by careful firing. With the high steam pressures becoming established, and the rapid flow of the gases necessary to generate steam with the rapidity it passes through the cylinders of a locomotive, doing the work of moving our heavy trains, it will never be possible to reduce the smoke-box temperature much below 600 degrees Fahrenheit. That being the case, the utilizing of 60 per cent. of the fuel heat is getting close to the possible limit.

Good firing is an essential that must never be lost sight of where efforts are made to make a locomotive boiler do its work to the best advantage. When this is attended to, the engine is suffering from some structural defect if the heat represented by the steam does not come close to 60 per cent. of the potential energy of the fuel. The most common mistake has been that of making the boiler too small for the cylinders, but it may occasionally be found that a boiler is large enough, yet badly proportioned in other ways. The fallacy which found numerous adherents for a time, that the tube surface was of little value in steam making, has been a costly piece of engineering heterodoxy to many railroad companies. The immense fire-boxes that came into use as a substitute for tube-heating surface have not contributed to the economy of fuel in ordinary service. Where a locomotive has to work nearly at its maximum power all the time, an immense grate area common to the large fire-boxes will conduce to economy, since a moderate quantity of coal will be consumed per foot of grate, but when an engine of this kind is required to work light, the consumption of coal becomes so low for the area the fire is spread over, that it is impossible to prevent waste by the cool air reducing portions of the fire-box below the igniting temperature.

With a very large grate, the tendency is to supply more air than the fire requires. Every cubic foot of air supplied beyond what is necessary for chemical combination, is so much superfluous gas that has to be heated and passed through the tubes. As the heat produced by a pound of coal is always the same, the temperature of the fire varies inversely with the quantity of air heated by the combustion. This being the case, it is not surprising that much disappointment has resulted from the promiscuous increase of grate area in locomotives that work light a great part of the time. The kind of coal to be used and the nature of the service the engine will be required to do, ought to influence directly the proportions of grate and heating surface to cylinder capacity. When these questions receive intelligent consideration, our master mechanics may safely depend on getting an economical locomotive boiler.

SUBURBAN PASSENGER TRAFFIC.

No business or source of good income has been so much neglected by railroad companies as city and suburban passenger traffic, unless it be city freight transportation. The small single fares to be charged for passengers for traveling a mile or two, did not readily appeal to the imaginations of railroad managers, and through traffic that represented a considerable sum in hand for each passenger or package of freight has been sedulously cultivated and fought for when in many cases the net profit was trifling or amounted to nothing. Struggling to obtain pretentious through traffic while neglecting suburban business, has too often resulted in securing the big shadow and losing the solid substance.

Until the elevated railroad companies of New York began to demonstrate by their handsome revenues that there was money to be made from the small fares and quick returns of city and suburban traffic, almost nothing was done by the railroad companies running into other cities to develop this kind of business where their roads could conveniently handle it. Of late years a more enterprising policy has been adopted, and many surface railroads running into large cities are trying to work up city and suburban passenger business, but as a rule it is done in a perfunctory, half-hearted way. Railroad companies in America have been noted for the great enterprise displayed in extending well built tracks away out into the wilderness, where years of slow development must elapse before growth of settlement will produce business enough to pay for the first cost. If the same kind of enterprise were displayed by surface roads in sowing the seed of suburban traffic, a bountiful harvest would be reaped before many days.

The tendency of American business men is to live outside the cities where their stores, shops or offices are, and very little encouragement in means of rapid transit leads to quick growth of suburban population. There is not a city with more than one hundred thousand inhabitants where a remunerative suburban passenger business could not be developed by the surface roads, yet in many instances it is utterly neglected and leads to the prevailing demand for elevated railroads. Apart from the roads that make suburban passenger traffic their leading business, New York is very poorly provided with the means of taking people in and out of the city rapidly. It is almost impossible to be transported ten miles from the post-office in less than an hour, although it ought to be done in half that time, notwithstanding ferries have to be crossed. Boston, Philadelphia and Chicago all suffer under more or less inconvenience for want of rapid transit, and the smaller cities have even greater reason for complaint.

In Chicago, the Illinois Central Railroad Company have proved a noteworthy exception to the apathetic way the valuable suburban traffic of that city has been neglected. They have for years followed the policy of developing this business by means of cheap fares and good service of trains, till now the company are reaping the reward of a good, remunerative business, which is easily handled at small cost. The ordinary custom is to use for suburban work old, worn-out rolling stock that is not considered safe for road service. Cars regarded as too weak to withstand the concussions incident to heavy through traffic, are considered good enough for local and city business, and locomotives so badly run down that the cylinders use steam faster than the boiler will make it, are regarded as proper power for handling suburban trains. With such rolling stock travel is uncomfortable and uncertain, so passengers who can do so avoid roads run in this fashion. The Illinois Central Company did not fall into the mistake of treating their suburban passengers as if their convenience and comfort deserved no consideration. The cars are built specially for the traffic, and are as comfortable and convenient as such cars can be made, at the same time being so light that less than 600 pounds of dead weight have to be hauled per passenger accommodated. The locomotives, which are double-ended tank engines, are also made specially for the work of getting the suburban trains quickly over the road, and they do the service admirably. If other railroad companies would display similar enterprise in managing suburban business, they would serve their own interests thereby and there would be less call for improved means of rapid transit. The greatest objection to putting on a good service of local trains is, that the movement of trains in the yards is interfered with, which means that the main tracks must be continually used for switching. In nearly every instance it would pay to extend the yard accommodation so that the main line could be kept clear enough to move trains every fifteen minutes. Any change that will tend to keep the arteries of traffic to and from great cities open for passenger trains alone will be a step in the right direction.

Ignorance of How the Air Brake Works.

A discussion which arose in the late Master Car-Builders' convention about the slicing of wheels, turned somewhat naturally upon the Westinghouse automatic air brake, and several of the members who spoke on the subject revealed very plainly that their knowledge of the apparatus they were ready to improve was of the most imperfect character. There is room for great difference of opinion respecting the proper adjustment of brake levers for the prevention of wheel sliding, but there ought to be entire unanimity as to the necessity for railroad mechanical officers understanding the action of any apparatus before they think of making changes upon it.

Complaints are often made because trainmen who use the air brake daily remain so ignorant of its mechanism that they are unable to apply the remedy for a simple derangement, but such men can hardly be blamed when their superiors open their mouths only to let the world know how little they understand about the brake.

The cause of the prevailing want of accurate knowledge respecting the action of the air brake and other railroad mechanism is, that men expect to learn the operations of a train of mechanism without studying out each part and its relation to other parts. The greater number of men are ready and willing to do hard work with their hands when duty or necessity requires it, but the men who are ready to work by exercising their brains are exceedingly few. The mechanism of an air brake is by no means complex or hard of comprehension to the man who will study it out, but the man who tries to understand the brake as he would a plow, merely by handling, gets left every time. There are too many who never make their thoughts go more profoundly in search of the causes that regulate a brake's action than they devote to studying a plow's working. They learn to handle one or the other, and that is all they care about it.

The instruction cars and other facilities provided by railroad companies for educating their employés on air brakes and other railroad mechanism not so easily understood as a tamping pick, are doing good work of enlightenment; but they leaven the mass of ignorance slowly. In some cases their progress is restrained by zeal for enlightening the railroad man faster than his capacity admits. One of the shrewdest of our master mechanics lately visited a place where there was an instruction car, and he watched the methods followed. An engineer of his acquaintance happened to be among the party undergoing instruction. When the lesson was over they went out, and the master mechanic asked the engineer if he understood the brake properly now? "I don't know any more about it than when I went in" was the answer. The answer was accepted by the observer as typical, and his impression was that the instructor was trying to explain too much in one lesson. A man quick in perception might grasp the principle and perceive the relation to each other of numerous details, but the dull man would lose a leading point, and to him all subsequent explanations would be unintelligible. Few men are quick at following explanations of mechanical details, and explanations of the brake apparatus should be given so that the dullest should receive enlightenment. This can only be accomplished by taking point by point and questioning the learner individually as to how he understood how each part worked. A system of imparting instruction in this simple and elementary fashion might be judiciously extended to men above the position of ordinary railroad employés.

The Twenty-four o'Clock Time System.

This system has gone into practical operation as a railroad employés time-table on the Western Division of the Canadian Pacific road. The result of the experiment will doubtless be watched with a good deal of interest by railroad men, although it is manifest that the new method of reckoning time is not regarded with much favor by the general public. As a mere theory, the proposed innovation has an inviting aspect, but when the obstacles which lie in the way of its universal adoption are fairly considered, they are found to be much more formidable than those which had to be overcome in the establishment of meridian time. The 12-hour time schedules of roads running a large number of trains can not be changed to 24 hours without breaking up a long-established usage, which, like the action of the lungs, can not be suspended without causing a very great derangement of the existing order of things. It does not seem practicable to have a 24-hour system for railroads and a 12-hour system for every body else. The personal and business intercourse of a vast population, as well as a multitude of statutes and ordinances in which the hours are referred to, are all in accord with the present system, and the advantages of a new one must be very great indeed to insure its general acceptance.

It would be desirable, of course, to get rid of the "A. M." and "P. M." by numbering the hours continuously from 1 to 24, if the inconveniences inseparable from the plan were not greater than those of the old method. The hours are now expressed in monosyllables, and brevity in this respect is quite an important matter. In the proposed change we add 8 two-syllable and 4 three-syllable hours, all of which are much less euphonious in expression than the numbers from 1 to 12. So ludicrous, in fact, is the contrast between "21 o'clock" and "9 o'clock," for example, or "23 o'clock" and "11 o'clock," that the lapse of a generation or so may be required to reconcile people to it. It must also be remembered that the 12-hour system is now practically world wide, and is recognized among all commercial and civilized communities. The feasibility of the proposed reform is also hampered with another difficulty of no small importance, and that is the practical adjustment of the dial-plates of time-pieces to the new order of things. The hour figures on the faces of clocks and watches, as these figures are now placed, bear a relative proportion to the space, whether the dial-plates are large or small. To place the numerals (whether Arabic or Roman) from 12 to 24 in one circle or series, would reduce the intervening spaces so as to leave altogether too small a space for the minute marks. To avoid this very serious difficulty it is proposed to have the additional 12 hours represented by an inner and smaller circle of figures, which is really the only practicable way of getting the whole 24 hours on the dial-plate. But it is an awkward way at best, and altogether too complicated to be a satisfactory substitute for the existing method.

We say this much in no dogmatic spirit, but only as setting forth some of the obvious difficulties which the new movement has to encounter. In behalf of the movement it should be said that at the meeting of the American Society of Civil Engineers, in January, 1885, a committee on the subject reported that 171 railroad officials, representing some 60,000 miles of road, were in favor of abandoning the 12-hour system as soon as practicable. A similar report was made on the subject at the January meeting of the Society this year.

MR. R. H. BRIGGS, superintendent of motive power of the Chesapeake, Ohio & Southwestern Railway, severed his connection with the company at the end of August, after having been with them for three years. During his connection with this road, Mr. Briggs, by the exercise of great energy and mechanical ability, built up a respectable plant of rolling stock out of a conglomeration of scrap that previously was doing service as locomotives and cars. At the last meeting of the Master Mechanics' Association Mr. Briggs was elected one of the vice-presidents. He has always taken an active part in the business of the association, and is acknowledged to be one of the most energetic and clearest-headed members. We believe Mr. Briggs is open for an engagement.

AN impression prevails in Britain that all American railroads are unfenced, and that cattle grazing on the tracks present a constant source of danger to travelers. According to a recent return of accidents on Indian railways, we find that American railroads are not the worst cattle-infested tracks in the world. In the return referred to we find about 700 accidents of all kinds are reported, more than a third of these being due to the presence of cattle on the line—the most fruitful source of accidents in the country. On the other hand, only one railway servant was killed and fifteen servants and passengers injured. The Rajputana-Malwa railway has slain more cattle than any other. Its average is a high one at all times, owing to the long stretches of the line unfenced. The Indus Valley State Railway—a wood-burning line—heads the list in fires on trains, the bursting of boiler tubes, and the failure of springs and machinery of engines. The casualties to passengers from their own carelessness, etc., amount to thirty-two altogether, eight men being killed and twenty-four wounded. Twenty-six railway servants were killed and 114 injured in the discharge of their duty; while eighteen outsiders committed suicide, and two were injured in attempting to do so. The grand total of people killed from causes of all kinds connected with the working of trains is 105, as compared to 80 in the corresponding quarter of the previous quarter. But only one passenger met his death from causes beyond his own control.

A WRITER in the *Railway Age* thinks a good way to prevent strikes and bring about a labor millenium, would be to give every railway employé a co-partnership interest in the property of the company by which he is employed. This, he argues, would make every employé loyal to the service; and in order to hasten this desirable state of things, he suggests that railway companies would be the gainers by making each employé a present of one share of stock. We would also suggest that the best way to test the merits of such a scheme is to try it. Let each company at once make a free gift of one share of its stock, worth anywhere from nothing to a hundred dollars, to each employé, and see how many of the shares would be in the hands of the recipients at the end of six months, and also how many of the employés would be in the employ of some other company in a year or two, with no one-share-of-stock tie of reciprocal interest to clinch their new allegiance and prevent them from going on strike whenever the grand commander of some self constituted labor protective association shall issue orders to that affect.

Brake Test Meeting.

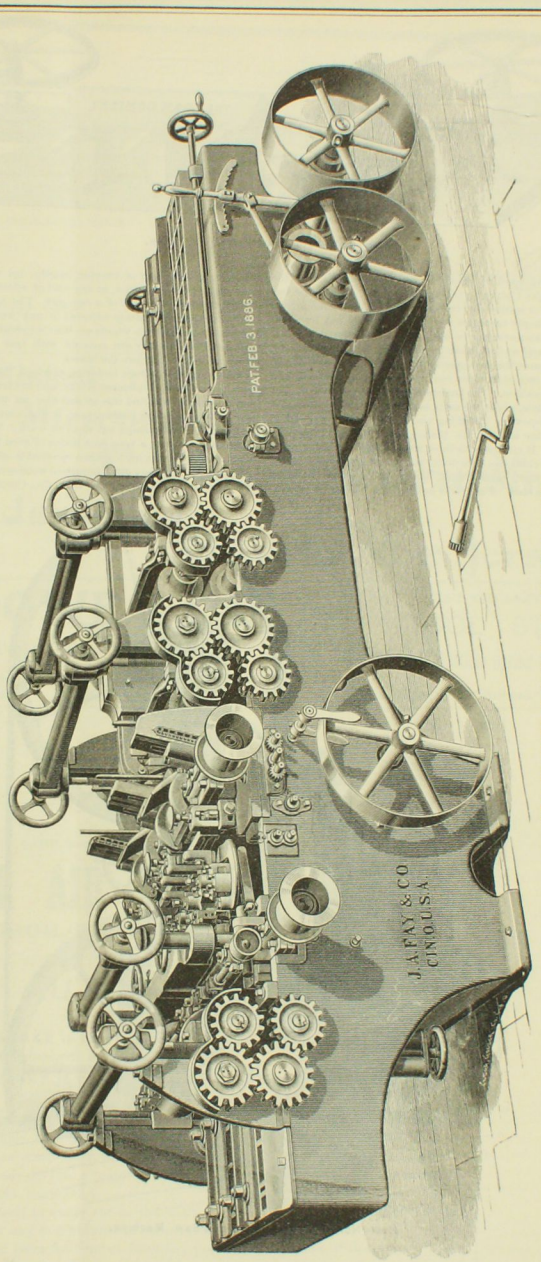
Mr. Godfrey W. Rhodes, Chairman, has issued the following notice, dated Aurora, Ill., Aug. 14:

"A joint meeting of the M. C. B. Brake Committee and the brake companies participating in the recent Burlington tests will be held at 10 o'clock A. M. on Wednesday, Sept. 15, at 73 Broadway, New York. At this meeting the rules laid down at Harrisburg for the endurance test and the April, 1887, test will be reconsidered."

All parties concerned are requested to inform the Chairman whether they can be present at this meeting.

The National Car and Locomotive Builder Supplement for the current year has just been issued. Its form and appearance are the same as the previous issues. It is mainly devoted to advertisements, in which is represented an extensive variety of railroad appliances, tools, equipments and general supplies, which are classified and indexed for convenient reference. It also contains carefully-prepared directories of car and locomotive builders, rail mills and car wheel, axle and spring manufacturers; and in addition to these, the most complete list of street railways in the United States, Canada, and Central and South America ever published. A copy is sent gratuitously to every person whose name appears in it, and also to all railway officials in the United States and Canada. Prepared and issued by John N. Reynolds, Morse building, N. Y.

Doane's Duplex Flooring Machine.

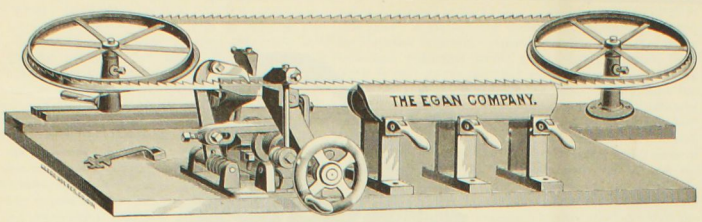


DOANE'S PATENT DUPLEX FLOORING MACHINE.

The machine represented in the engraving has recently been introduced by J. A. Fay & Co., of Cincinnati, and is claimed to be the most rapid and powerful planing and matching machine that has ever been designed. It is also said to be capable of performing a greater amount of work per day, at a greatly reduced cost of production, than any existing machine of its class.

It will plane on both sides, and tongue and groove all four edges, and work a bead upon the top surface of two separate flooring boards at one operation, with a capacity of 40,000 to 60,000 ft. per day, according to the speed of feed at which it is run. It is said that with this machine one man can feed 40,000 ft. of lumber easier than 20,000 ft. through an ordinary planer. It is remarkably simple, and the arrangement and combination of its parts are such that it is at all times under perfect control of the operator. It is constructed upon a massive and heavy frame, with broad sole plates affording large floor area, duplex feeding in rolls, duplex upper cutting cylinders, duplex matching works, for operating upon the edges of two boards at one operation, duplex pressure bars for the under cylinder, and duplex beading attachments, one for each board. The feed rolls are of large diameter, two set in front of the upper, and one set after the lower cylinder. These take the lumber entirely out of the machine and retain each board always in a straight line. The feed-rolls are gibbed to planed upright stands, and driven by a train of heavy patent expansion gearing, the invention of J. A. Fay & Co. The cylinders are made from solid wrought steel, slotted on all four sides, with chip breaking lips for cross grained lumber. The duplex upper cylinders, also the lower cylinders, run in long and heavy bearings, with large pulleys for wide belts, and driven direct from the countershaft. The upper cylinder frames and bearings are planed to fit upright stands, which are cast to a solid bed, extending across the machine, which ties them together in a rigid manner, and always retains them in line. The upper cylinders raise and lower, both simultaneously or independently, and have adjustable pressure bars before and after the knives. Those before the cut can be set in close proximity to the cylinder, and still follow its periphery without liability or danger of contact with it.

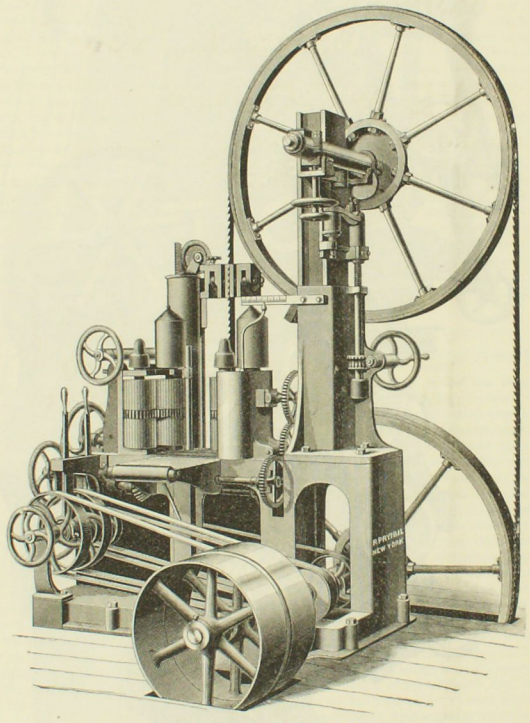
The matching works are adjustable to suit the width of the board from the working side of the machine. The pressure bars over the under cylinder are duplex, and have both a simultaneous and independent vertical adjustment, or by removing a pantle, can be thrown out of the way for access to the cutters. The lumber platen has the duplex board guide, also patent duplex automatic edge feed for carrying the board to the first feeding rolls. This is an advantage over the old method, as the lumber is moved in a straight line to the feed rolls, and through the cutting tools, even if warped and crooked in ordinary fast feed planers, the cutting cylinders run at a very high speed with a feed of $\frac{1}{16}$ inch to $\frac{1}{4}$ inch at each revolution of the cylinder, which necessarily causes inferior work. With this machine it is just the opposite. While the cylinders are run at the usual speed, the feed is slow, permitting the easy feeding of two boards by one attendant, and yet on account of its duplexity it is capable of an enormous amount of work. Every part is accessible and within easy reach of the operator. It is built in the most careful and thorough manner, and warranted to give the highest satisfaction. While it is duplex in its character, and will finish in the most perfect manner two boards of varying thickness, it is not in any sense complex, but as simple as an ordinary planer. The capacity of this machine is to plane two sides up to 6" thick, and match up to 8" wide on two pieces of flooring of unequal thickness simultaneously. Only the best material and labor are used in the construction of this machine. All the revolving parts are balanced with care, and all surfaces are planed to fit. Every machine is subjected to a thorough and practical test to insure perfect completeness in all its parts, and they are guaranteed to perform as stated. It weighs boxed, about 13,000 lbs. For further particulars, address the patentees and manufacturers, J. A. Fay & Co., Cincinnati, Ohio.



New Automatic Saw-Setting Machine.

The convenient machine shown in the engraving is from the shops of The Egan Company, Cincinnati, O., and is the latest improved device for setting two teeth of a band saw blade at the same time by simply turning a wheel. The saw is fed forward, and two steel hammers (one on each side) strike the teeth at the same moment and set both teeth to the same extent on each side, thus making one of the most speedy and perfect saw sets in the market. The face of hammer can be adjusted to strike in any desired radial position. The hammers do not push the teeth, but strike a good blow, about the same as a workman who sets a saw tooth by hand-power. The filing vise is something new, and in keeping with the saw set, the blade passing through it directly from the set. It clamps with three handles, and no springing or sagging in the center can take place, and will be much appreciated by the expert filer, as the finest blades can be held in it as well as the wide ones. The frame holding the wheels is adjustable, so as to take saws of varying lengths, one wheel pivot moving back and forth in a slot, at any part of which it may be instantly clamped by means of a cam nut. The arm which feeds saw forward can be quickly adjusted to any length of tooth or any feed desired. Both wheels are also adjustable vertically on their spindles, and they are covered with best quality of pure rubber, so as not to injure the blades.

Planing mills, furniture factories, carriage, buggy and wagon shops, agricultural implement works, and in fact all parties running band saws, will find this set and filer an invaluable tool in their factories, always keeping saws in fine condition, thus avoiding breakage, and turning out superior work. The set, vise and wheels are placed on a very neat platen of even height, as shown in cut, so that the apparatus when received is all ready for use. For prices of this or any other improved wood-working machinery, address the manufacturers, The Egan Co., Cincinnati, O.



New No. 6 Re-Sawing Band-Saw Machine.

This machine will saw from 12,000 to 15,000 feet per day of ten hours, making a kerf of only $\frac{1}{16}$ of an inch, or less, and getting from 1 inch stuff two pieces thick enough to make two $\frac{5}{8}$ inch panels after being planed on both sides. The importance of this point, especially when costly woods are used, is apparent when it is considered that with many machines such a result can be reached only by the use of $1\frac{1}{4}$ inch stuff.

The feeding is effected by four strongly geared live rolls and two smaller idle rolls, the latter being so arranged as to guide the last end of the stuff after it has passed the first pair of live rolls and until the finish of the cut. Strong springs behind each of the bearings of the two feed rolls at the left of the saw hold these rolls up to the work and enable them to yield to all inequalities in the stuff. As either top or bottom of these rolls can yield independently or both together, a good bearing against the work is always insured, and the stuff is compelled to follow the guidance of the non-yielding rolls. Four rates of feed are provided, any one of which can be thrown in or out of operation by moving a hand-lever and without belt shifting. The saw runs between hardened steel plates filled with dog-wood plugs, with the end grain in contact with the saw, and each plate can be accurately adjusted by a single screw. The back of the saw bears against hardened steel rollers, which can be adjusted sideways as they become grooved from use. These rollers are also adjustable to different widths of saws, and are provided with self-oiling bearings. The upper guide is counterbalanced by a weight hidden in the guide-post, and is geared to a hand-wheel, by means of which its height can be easily varied. This hand-wheel, the levers for changing the feed and the hand-wheels for setting the feed-rolls, are all accessible from the operator's position, and can be manipulated while the machine is in motion. The rims of the wheels are of bent ash, strong and light, and they overhang the ends of the bearings, which latter are self-oiling. The overhanging feature is quite important, effecting, as it does, the same result that some makers obtain by the use of a clumsy and complicated arrangement of outside bearings. The upper shaft can be angled while the wheels are in motion. It is carried on a slide, cushioned upon an adjustable spring, which maintains a proper tension on the saw throughout all variations of length due to change of temperature. This renders the saw much more secure against breakage than the weights commonly used for this purpose, as the inertia of weights prevents them from yielding quickly enough when a chip gets between the saw and the wheel, the result being a broken saw. To provide doubly against such an accident, a wooden block is so fitted in the throat between saw and wheel as to catch all chips and sawdust and discharge them beyond the rim. The lower wheel is kept free from accumulations of sawdust by a scraper, and the upper one by a brush. The body is a box-shaped casting, in one piece, very strong and rigid, and it insures the permanent alignment of all the parts. The loose pulley is self-oiling, one inch smaller in diameter than the tight pulley, to slacken the belt when the machine is stopped, and it is provided with a step at the inner edge to cause the belt to shift easily. Fitted feed-belts are furnished, and every machine is tested before leaving the factory. Weight of machine complete, about 6,000 lbs.; diameter of wheels, 60 in.; driving pulley, 22 to 30 in. diameter, as ordered for 8 in. belt. Speed, 400 to 450 revolutions per minute; thickness taken between feed-rolls, 17 in.; height of stuff that can be sawed, 30 in.

Manufactured by P. Pryibil, 461 West Fortieth street, New York.

We are requested to say that Mr. N. W. Talcott, the proprietor of the Talcott Forge, Springfield, Mass., died July 18, and that his forge is for sale.

The Prospect Machine & Engine Co., Cleveland, O., have recently shipped two engines aggregating 276 h. p., to the Hadley Thread Co., Holyoke, Mass.; one of 139 h. p. to the Joshua Hendy Machine Works, San Francisco, Cal.; one of 190 h. p to the Dennison Paper Co., Mechanic Falls, Me.; and four engines of 50 h. p. and under, to the Borden Condensed Milk Co., Northville, Mich., and C. F. Wardell, of Chicago.

The Peerless Mfg. Co., Louisville, Ky., have issued a handsome illustrated and descriptive catalogue of the Rice Sand Molding machine, of which this company are the manufacturers. Full details are given setting forth its advantages as compared with the old process of making molds. The different stages of the new process are represented by three well executed engravings of the machine, and the fourth shows the machine in a form specially adapted to the molding of plow points.

Circular.

St. Louis, Aug. 9, 1886.

Having been informed that of late certain rolling mills have been manufacturing and selling iron of their own make as "Tennesse Iron," and being the sole owners and operators of the Tennessee Rolling Works (the originators and owners of this brand), we hereby give notice that we have complied with the laws governing registration of trade-marks, etc., and have, in order to protect both our customers and ourselves, duly registered as our's, and propose to protect by law, as such, the following trade-marks or brands, one of which will in future be found stamped on any plate or sheet of iron made by us: 1. "Ewald's Tennessee Bloom;" 2. "Ewald's Juniata;" 3. "Ewald's Lyon;" 4. "Ewald's Charcoal." Ewald Iron Company.

Our Directory.

We note the following changes since our last issue. Our readers will do us a great favor by giving us prompt notice of any changes that may come to their knowledge or of any errors that may be noticed in our list:

Alabama Great Southern.—A. Griggs, Master of Transportation, has been made Superintendent of this road, in place of Daniel McLaren, resigned.

Boston & Lowell.—A. B. Jewett having accepted the position of Vice President of the St. Johnsbury & Lake Champlain road, the duties of Superintendent of the Vermont Division will hereafter be performed by Mr. W. A. Stowell, until further notice.

Cairo, Vincennes & Chicago.—F. W. Stapf has been appointed Master Mechanic, vice A. N. Van Tuyl, deceased.

Cape Fear & Yadkin Valley.—J. W. Fry has been chosen General Superintendent in place of W. M. S. Dunn, who has gone to the Chesapeake & Ohio.

Cornwall & Lebanon.—Ned Irish has been appointed General Superintendent, in place of J. C. Jennings, resigned.

Denver & Rio Grande Western.—D. C. Dodge has been appointed General Manager, and W. H. Bancroft General Superintendent.

Illinois Central.—J. G. Mann succeeds C. M. Sheafe as Superintendent of the Southern Lines, and H. W. Clarke succeeds Mr. Mann as Superintendent of the Mississippi Division.

Missouri Pacific.—Samuel Irvin has been appointed Master Car-Builder in place of John Hodge, resigned.

Newport News & Mississippi Valley.—This company operates the Chesapeake & Ohio; Chesapeake, Ohio & Southwestern; and the Elizabethtown, Lexington & Big Sandy roads. W. M. S. Dunn has been appointed General Superintendent of the Eastern Division, which includes the C. & O. and E. L. & B. S.

New York, Lake Erie & Western.—J. F. O'Brien has been appointed Superintendent of the Mahoning Division of the leased New York, Pennsylvania & Ohio road, in place of N. F. Wood, resigned.

Newburgh, Dutches & Connecticut.—Gilman D. Holmes has been appointed Master Mechanic and Master Car-Builder, vice Wm. G. Van Buskirk, resigned.

New York City & Northern.—Joel B. Erhardt has been appointed Receiver, Frank S. Gannon has resigned as Superintendent, and the office will remain vacant.

New York & Sea Beach.—O. R. Whitney, recently Master Mechanic, has been appointed General Superintendent.

Piedmont Air Line.—A. W. Gibbs has been appointed Master Mechanic of the Atlanta & Charlotte Air Line Division, vice T. W. Gentry, transferred to Richmond & Danville Division.

Pullman Car Co.—F. J. F. Bradley has been removed from the position of Manager of the Pullman Car Works, at Pullman, Ill.

St. Louis, Arkansas & Texas.—W. H. Selby has been appointed Master Mechanic. He was recently on the Council Bluffs & St. Louis road.

Texas & Pacific.—J. H. Redmond has been appointed Division Superintendent, with office at Marshall, Texas.

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Wanted.—By a first-class Master Painter and practical Car and Locomotive Painter, a situation as foreman in a railroad paint shop, or in some other capacity in the painting department. Has had long experience in the painting and decoration of sleeping cars and ordinary coaches, as well as in locomotive work. Is a married man, and can furnish the best references. Address "Painter," office of National Car and Locomotive Builder.

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THE AUTOMATIC BRAKE will, in consequence of its quick application, stop a train in the least possible distance.

THE AUTOMATIC BRAKE on freight trains, as in passenger service, applies itself instantly to all parts of the train in the event of the train breaking into two or more parts, a feature of great importance in view of the statistics published in the *Railroad Gazette*, which show conclusively that a majority of the collisions are caused by the breaking in two of trains. (See *Railroad Gazette*, Feb. 12, 1886, page 113.)

THE AUTOMATIC BRAKE also applies itself to every car in the train, in the event of any accident to the brake apparatus of such a nature that it would render any non-automatic continuous brake inoperative.

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THE AUTOMATIC BRAKE will prevent a greater part of the accidents to freight trains which form so large an item of expense in railway management.

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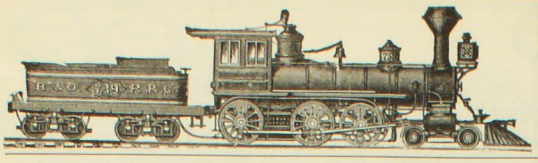

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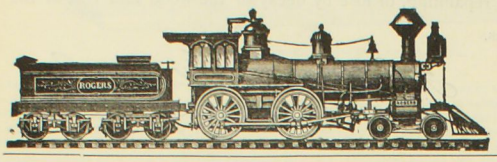

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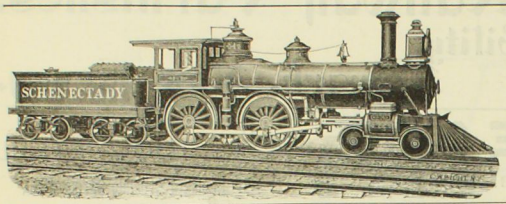

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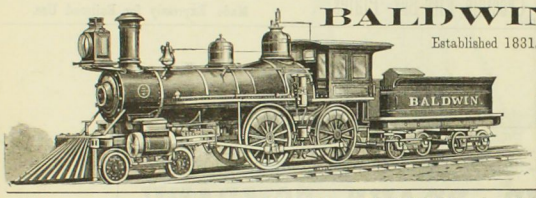

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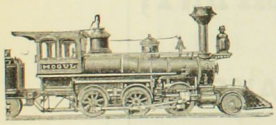

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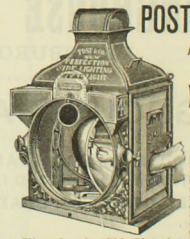

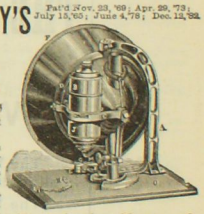

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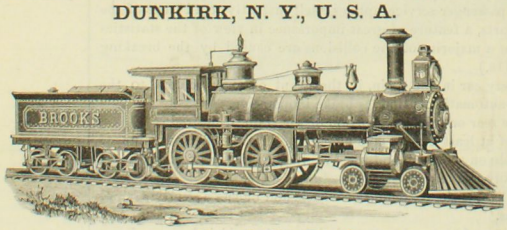

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